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BULLETIN No. 94. 380

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
A. C. TRUE, Director.

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FOURTH REPORT

ON THE

AGRICULTURAL INVESTIGATIONS IN ALASKA,

1900.

BY

C. C. GEORGESON, M. S.,
Special Agent in Charge of Alaska Investigations.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1901.

PLATE I.

INDIAN VILLAGE ON THE TANANA RIVER.

BULLETIN NO. 94.

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To the Senate and House of Representatives:

I transmit herewith a fourth report on the investigations of the agricultural capabilities of Alaska for the year 1900, in accordance with the acts of Congress making appropriations for the Department of Agriculture for the fiscal years ending June 30, 1900, and June 30, 1901.

Attention is called to the request of the Secretary of Agriculture that if this report is published by Congress, 2,000 copies be printed for the use of the Department of Agriculture.

William McKinley.

Executive Mansion,
January 16, 1901.

LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Office of Experiment Stations,
Washington, D. C., January 4, 1901.

Sir: I have the honor to transmit herewith a report on the agricultural investigations in Alaska conducted under my direction during the past year. The report is in continuation of that transmitted to Congress January 13, 1900, which was published as House of Representatives Document No. 314 (Fifty-sixth Congress, first session), and afterwards as Bulletin No. 82 of this Office, and covers the operations conducted during the calendar year 1900.

The appropriation bill for this Department, approved May 25, 1900, set aside $12,000 to be expended by the Secretary of Agriculture "to investigate and report to Congress upon the agricultural resources and capabilities of Alaska, and to establish and maintain agricultural experiment stations in said Territory, including the erection of buildings and all other expenses essential to the maintenance of such stations."

Prof. C. C. Georgeson was continued as special agent in charge of the investigations, and Mr. F. E. Rader was appointed as assistant at the Sitka Experiment Station. The services of Mr. Isaac Jones, a graduate of the Kansas Agricultural College, were secured for whatever investigations should be undertaken in the interior of the country.

The experiments with cereals and vegetables were continued at the Sitka and Kenai experiment stations with great success, and numerous cooperative experiments were inaugurated with almost uniformly good results, as is shown in the accompanying report. An extensive series of experiments was conducted at the Sitka Experiment Station illustrating the effect of fertilizers on new soil as shown in the production of oats, barley, and potatoes. It has been shown in previous reports that many failures to grow crops in Alaska have been largely due to lack of drainage and to acidity of new soil. Brush drains have been found a cheap and efficient means for draining the soil, and it was learned by experiments herein reported that crops can be grown on new land by the proper application of fertilizers. Successful experiments are also reported in the construction and filling of a silo with the native beach grass. The silage when examined was of excellent quality, and the loss due to admission of air was very slight.

Investigations at the Kenai station were in continuation of those inaugurated the previous season. Owing to a lack of drainage the fall-sown cereals were winterkilled, but spring-sown barley and oats matured good crops and vegetables were reported of fine quality. Mr. H. P. Nielsen, who was continued in charge of the Kenai station, writes that the "example of one year's experiments has already done good, as may be seen by the increased number of small gardens in the vicinity of the station." Additional land has been cleared and prepared for cultivation at both the Sitka and Kenai experiment stations.

One of the most important features of the work of the year was the preliminary survey of the interior of Alaska and the location of experiment station tracts at Rampart and Fort Yukon in the valley of the Yukon River. Professor Georgeson and Mr. Jones traversed the Yukon country, starting from Dawson July 6, 1900, visiting all the more important villages along the river, investigating their possibilities as agricultural centers. As a result two tracts of land were surveyed and their reservation for use in agricultural experiments is requested. They consist of 106 acres at Fort Yukon and 313 acres at Rampart. These places seem to be best adapted to further investigations, and whatever results are achieved at these points will apply to most of the interior region. Mr. Jones remained at Rampart and has already made preparations for beginning experiments with vegetables and cereals next season. For successful prosecution of the work in the interior, buildings, implements, and other equipments will be needed.

In the past year some advance has been made toward completing the station headquarters at Sitka, and work was begun upon the station building at Kenai, but the sum available for this purpose was so small that little was accomplished. The abnormally high prices of labor and cost of transportation make serious inroads upon the appropriation annually granted for these investigations. Add to these items the amount required as salaries and there is little left for permanent improvements and the necessary equipments.

The services of a skilled horticulturist are needed at the Sitka station to aid in the introduction of new and valuable fruits, and to improve the native varieties. The furnishing of a laboratory at this station is also necessary for the more accurate investigations contemplated and additional buildings are needed at all the stations. It is thought desirable to begin investigations in dairying, and for the foundation of the herd animals will have to be purchased. These and other contemplated improvements mentioned in the accompanying report will necessitate a larger appropriation than has hitherto been given.

Alaska is a large territory and of widely varying requirements. To meet these necessities stations have been established in regions which appear to be representative of large areas. There is an estimated area of 100,000 square miles of land on which agricultural operations could be conducted. Conditions in Alaska are very similar to those of Finland, where there is a population of 2,500,000 and where 34,000,000 bushels of cereals are raised annually. In 1895 there were in Finland 4,000,000 head of horses, cattle, sheep, and swine, and dairy products to the amount of $6,750,000 were exported. The special agent in charge of the Alaskan investigations believes Alaska is as good a field for agriculture as Finland if the proper encouragement be given it. It is believed that as the mineral and other resources of this country are developed a permanent population will be established and an agriculture will be developed which will be an important aid to the successful maintenance of industries already yielding annual products valued at millions of dollars. It will doubtless be found that many of the hardy cereals, as well as a great variety of vegetables, can be successfully grown in Alaska, and the experiment stations should be able to determine what varieties are best suited to the region. Considerable numbers of live stock may also be maintained and dairying may be developed.

I renew the recommendation contained in my annual report as Director of the Office of Experiment Stations for 1900 that an appropriation of $3,000 be asked for to cover the expenses of the Alaska investigations from April to June, 1901, in lieu of the immediately available appropriation hitherto made and in addition to an appropriation of $15,000 to cover the operations of the entire fiscal year 1902.

Very respectfully,

A. C. True,
Director.

Hon. James Wilson,
Secretary of Agriculture.

LETTER OF SUBMITTAL.

SITKA, ALASKA, *December 1, 1900.*

DEAR SIR: I have the honor to submit herewith my report on the agricultural investigations in Alaska for the year 1900.

In addition to the experimental work which has been carried on at Sitka and Kenai, I made a trip through the interior, in accordance with instructions, and surveyed two tracts of land at Fort Yukon and Rampart, respectively, with a view to have them reserved for experimental purposes. Full details of the trip are submitted herewith.

Very respectfully,

C. C. GEORGESON,
Special Agent in Charge of Alaska Investigations.

DR. A. C. TRUE,
Director Office of Experiment Stations.

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FOURTH REPORT ON THE AGRICULTURAL INVESTIGATIONS IN ALASKA, 1900.

WORK AT SITKA.

The work at the headquarters' station the past season has been confined to the improvement of the land already cleared and to the growing of experimental crops. The funds at our disposal did not admit of finishing the building, clearing additional land, or of adding anything to our equipment in the way of live stock, implements, or laboratory apparatus. The work may perhaps be best discussed under the following heads:

Improvement of the New Land.

About 2 acres of land, which was cleared and drained last year has been broken, some of it graded where there were hollows, and part of it seeded to various crops. In addition, stumps have been burned and drainage ditches dug over an additional area of about 2 acres, which it is hoped to have in condition for cropping next year.

Drainage.—It was found that the brush drains which were built a year ago worked very satisfactorily. The method of constructing these drains was mentioned in last year's report. A drainage system is laid out over the portion of the ground which requires drainage in such a way that the soil water can be carried off with the minimum amount of ditching. Owing to the variation in the contour of the ground, the ditches are seldom parallel, but radiate from the main ditch at various angles. The ditches are dug about 4 feet deep and only wide enough to admit of a man working in them, usually about 20 inches. When all the ditches are dug they are packed with brush, beginning at the upper end of the ditch. The brush is laid at an angle of about 30 to 40 degrees sloping up the ditch and with the butt ends down. Packed in this manner as closely as possible until the ditch is nearly full, a layer of moss is then put over the brush and the earth which was dug out is shoveled on top. It is necessary to use plenty of brush and to pack it as closely as possible, otherwise the dirt will settle to the bottom of the ditch when the brush begins to decay and the drain will lose its usefulness.

Any kind of brush that comes handy will answer the purpose. Alder, willow, spruce, and the stunted *Pinus contorta* have all been used.

The drains run freely after every heavy rain, and the best proof of their efficiency is the fact that places over which it was impossible to drive work oxen before they were drained can now be worked without serious impediment. I am so well satisfied with the results that we shall follow the same plan for the future. I mention this matter again, because drainage will be absolutely necessary in order to reclaim much of the land in Alaska, and this is perhaps the cheapest method that settlers can adopt. Tile drains are, of course, to be preferred; but I consider that at the present time freight rates to Alaska would prohibit their use. Stone drains can be constructed so as to be as good as tile drains; but as a rule there is but little rock on the tillable land, and to transport it from the hillsides or gulches would likewise be expensive. Drains made of poles or boards can also be used, but in my judgment these are less efficient and more expensive than brush drains.

Growing Experimental Grain Crops.

The past season the following varieties of grain were grown. The leading characteristics of each are brought out in the notes on its habit and growth:

SPRING WHEATS.

Romanow.—Two small plats of this wheat were sown April 30 and May 5, respectively. The seeding of April 30 was upon gravelly soil, which was fertilized with fish guano sown broadcast at the rate of 300 pounds to the acre. The plat seeded May 5 was also gravelly soil, but naturally somewhat better than the preceding. It was not manured. Under date of June 11 it was noted that there was a good stand on both plats. The first seeding was 9 inches high and the second seeding 4 inches high. June 25 the first seeding was 18 inches high and the second seeding 12 inches high. July 9 the first seeding had begun to head and was 2 feet tall. The second seeding showed no heads and was but 16 inches tall. July 23 the first seeding was 40 inches tall, fully headed, and in full bloom; second seeding 32 inches tall and almost through heading. August 6 the first seeding was 4 feet tall and the grains well formed; second seeding also 4 feet tall, but most of it still in bloom. September 15 the first seeding had begun to ripen, and part of it was cut. The remainder and all of the second seeding was ripe and cut a week later. It could have been cut before that date had it not been for persistent wet weather.

This is the best variety of spring wheat that we have so far found. It matures earlier than any other variety tested, and only one other variety equals it in earliness, and that is the Ladoga. The seed of the

SHOCK OF ROMANOW SPRING WHEAT, SITKA EXPERIMENT STATION.

Romanow wheat was imported from Russia in 1897 by the United States Department of Agriculture. It stands up well and has a good-sized head with brown chaff and beards of medium length. The grain raised at this station is plump, of medium hardness, and would be classed in the grain market as No. 2 red. It yielded at the rate of 30 bushels to the acre. The accompanying illustration (Pl. II) shows this wheat in the shock.

Ladoga.—Seeded May 5. June 11 it showed a fair stand and was 3 inches high. July 9 it was 14 inches high. July 23, 2 feet in height and heading out. August 6, 3 feet high and in bloom. It was ripe and harvested September 24. Only a small sample was grown. It is an early spring wheat and will mature in this region every year. In appearance it much resembles the Romanow. The chaff is brown and the beards of medium length. It is inferior to the Romanow in vigor and in yield. The seed was obtained from the Central Experimental Farm, Ottawa, Canada.

Roumanian.—Seed of this variety was obtained from the Central Experimental Farm, Ottawa, Canada. It is a vigorous and handsome wheat, but it matures too late for this climate, and on that account I can not recommend it for Alaska.

Kubanka.—The seed of this wheat was imported from Russia by the Department of Agriculture, through Mr. M. A. Carleton, in 1898. A small sample was seeded May 4 in light, gravelly loam. On June 11 it showed a good stand and was 6 inches high. July 9, 2 feet 2 inches high and heading out. July 23 it was fully headed out, in bloom, and 3 feet 2 inches high. August 6 it was 4 feet high and had just finished blooming. It was harvested September 29. At this date it was not quite ripe, but could be harvested. The straw is slender, head square and short, spikelets very close together, beards of medium length. While it will grow here, and in the course of a few years could probably be adapted to this region, it is not as desirable a variety as the Romanow, and on that account I can not recommend it for Alaska. It will probably prove a desirable variety farther south.

Russian.—Seeded May 4 in the same kind of soil as the preceding, and near it. June 11 it was 6 inches high. July 9, 20 inches high. July 23, 3 feet high, fully headed and beginning to bloom. August 6, 3 feet 6 inches high and in full bloom. Like the preceding, it was harvested September 29. It was not fully ripe at that date. I do not consider it a valuable sort for Alaska. The seed was imported from Russia in 1898.

Pererodka.—This is likewise one of the Carleton importations. It was seeded May 4, and in growth and appearance closely resembles the Kubanka wheat, but it seems to be slightly later. It was harvested September 29, at which date most of the grains were still soft. I can not recommend it as a variety suitable to the Alaska coast region.

Polish.—This, too, was seeded May 4 in the same lot as the three preceding. The stand was not good, but its growth was exceedingly vigorous. The straw was fully 6 feet tall. It produced very large heads, some of them 6 inches long, but, to my regret, they had no grain in them. Now and then a spikelet could be found with a seed, but this was rare. I did not find a single normal head with the spikelets full. The seed is very large, often one-half inch long, white, and semitranslucent, but it is not suited to Alaska. It is one of the Carleton importations from Russia.

BARLEY.

In 1899 we raised upward of a dozen varieties of barley, most of which were six-rowed, though some were two-rowed. Out of the number some nine or ten were desirable varieties, which matured fully. Of these we have selected one which seems to be superior to all others, and that is the well-known Manshury barley.

Manshury.—Grown all over the Northern States. A patch of this variety was seeded April 30 on poor, gravelly soil and fertilized with fish guano at the rate of 300 pounds to the acre. On June 11 it showed a good stand and was 9 inches high. June 25 it was 18 inches high. July 2 it was heading out. July 23 it was 3 feet high and the grain was well formed. August 6 it was 3 feet high, the grain in the dough, and some of it beginning to turn yellow. This variety was ripe August 25, but it was not harvested until September 4. All things considered this is the best variety of barley for this region that we have yet tested. Seed was obtained from the Minnesota Experiment Station.

Beartown.—Seeded in a gravelly loam May 5. The seed was raised here at the station in 1899. It was originally imported from Norway. June 11 it was 3 inches high. June 25, 7 inches high. July 9, 14 inches high. July 23, 2 feet high and headed out. August 6, 30 inches high and grain well formed. It was ripe by September 5, but not harvested until September 22. This variety resembles the Manshury in all respects, but this year it was a little later and does not stand up quite so well.

Naked.—Seeded May 5. It made only a moderate growth; was ripe September 15, but the yield was very light. It can not be compared to the Manshury as a variety for general culture.

Kostroma.—This is a Russian variety of the Carleton importation. It was seeded on light, gravelly soil May 4. The stand was very thin and the plants only 2 inches high on June 11. On June 25 it was only 4 inches high. July 9, height 1 foot, and it was noted that it was doing poorly. July 23 it was 1 foot 6 inches high and not showing much improvement. August 6 it was 2 feet 10 inches high and beginning to head. This variety never ripened. It was cut green in the beginning of October and used for feed.

Shocks of Burts Extra Early Oats, Sitka Experiment Station.

Sisolsk.—This is likewise one of the Russian importations. Seeded May 4 near the preceding. On June 11 it showed a fairly good stand, was 4 inches high, but of a yellowish color. June 25 it was 10 inches high. July 9 it was 2 feet 4 inches high and beginning to head out. July 23 it was fully headed, beginning to bloom, and 3 feet high. August 6 it was 3 feet 8 inches high and grain well formed. It was ripe September 5. This is a very promising variety. It will probably be a close rival of the Manshury barley. The straw is stiff and stands our storms well, and the heads large and well filled. It is a six-rowed variety.

RYE.

Swedish.—The seed of this variety was obtained from the Office of Seed Control of the Swedish Royal Agricultural Society, Stockholm. It was supposed to be spring rye and a short, narrow strip was sown early in May 1899. It did not head during the summer and was left undisturbed over winter. June 25 it was 4 feet high, headed out, and beginning to bloom. On the 9th of July it averaged 5 feet, and some of the stalks were 6 feet high, in bloom. The heads averaged 6 inches in length, and the longest were 8½ inches on that date. August 6 the grain was in the milk. Ripe and cut September 4, having been growing for 16 months. The grain is very fine, the heads were magnificent, and the straw stood up well in spite of all the storms.

OATS.

There are several varieties of oats which appear to be equally well suited to the coast region of Alaska. Earliness and ability to stand up well during our autumn storms before harvesting are the most important features to consider.

Burt Extra Early.—This is a variety which has these attributes to a degree which should perhaps place it above all others. Its chief fault is that it is a light yielder of both grain and straw. A plat was seeded April 30 on light, gravelly soil, fertilized with fish guano at the rate of 300 pounds to the acre. On June 11 the stand was good and the height 9 inches. June 25 the height was 18 inches. On July 2 it was heading out. On July 9 it was fully headed, 2 feet high, and beginning to bloom. July 23 it was 30 inches tall. August 6 it averaged 40 inches high, the grain was in the dough, and the straw was beginning to turn yellow. It was ripe by August 20, but from press of other work at the time it was not cut until early in September. It is a variety which on account of its earliness can be recommended for all sections of Alaska where grain can be grown. The seed was obtained from the Minnesota Experiment Station. See illustration (Pl. III).

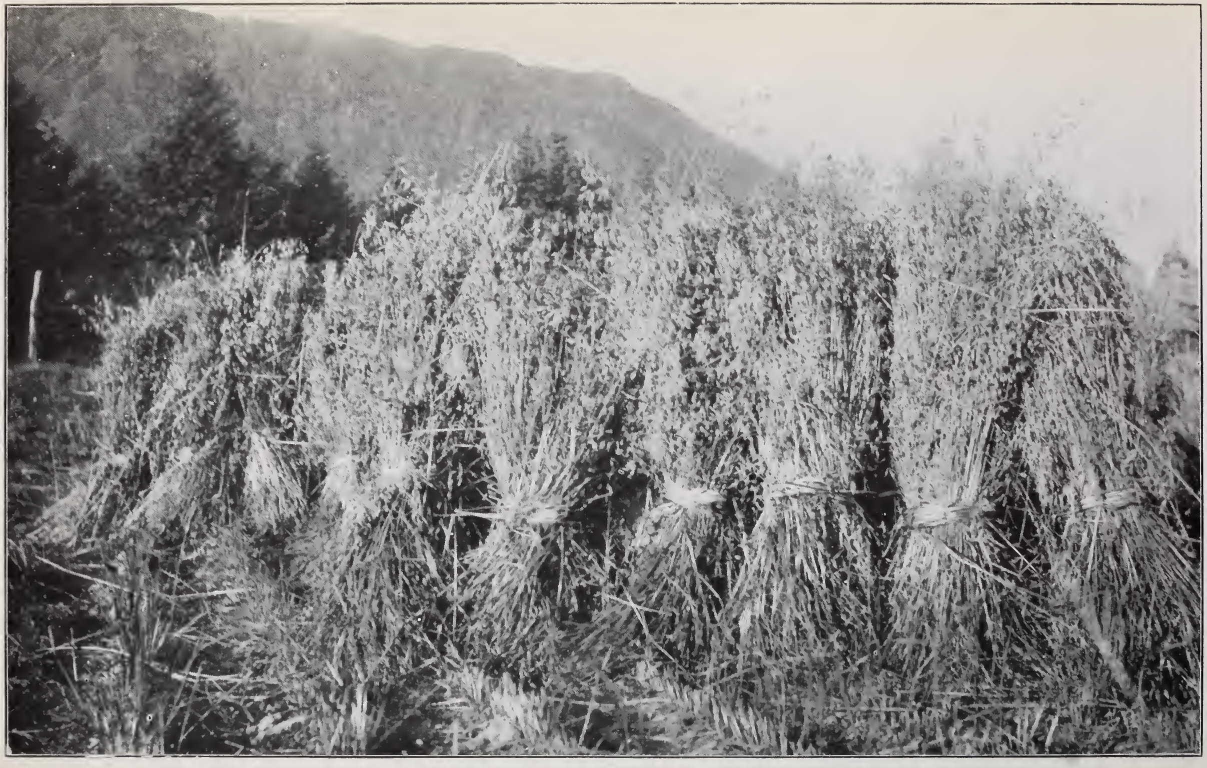
White Russian.—This variety was grown here both in 1898 and 1899, and did well both years. The seed was originally imported by the Department of Agriculture from Russia. The seed used this year was grown at this station in 1899. It was seeded in a gravelly loam May 5. June 11 it was 4 inches high and the stand was good. June 25 it was 14 inches high. July 9 it was 18 inches high and had a vigorous, healthy appearance. July 23 it was 30 inches high and about one-half headed. August 6 it was 4 feet 2 inches high and in bloom. It was ripe by September 10, but was badly lodged. The straw is coarse and heavy and does not stand up well. The seed is very large and plump and it is a most attractive variety, but it does not compare with the preceding variety in point of earliness. See illustration (Pl. IV).

Duppaur.—Seeded May 5 in the same lot as the preceding. June 11 it was 3 inches high and the stand good. June 25 it was 10 inches high. July 9 it was 16 inches high and had a healthy appearance. July 23, 27 inches high and beginning to head. August 6 it was 40 inches high and the grain was formed. It was ripe September 10, but was not harvested until September 28. A small sample of this variety was imported by the Department of Agriculture from Norway, and has been grown here at the station for three years. It resembles the White Russian very closely in all particulars.

Improved Ligowa.—This, too, was seeded May 5 in the same lot as the two preceding varieties. June 11 it was 6 inches high. June 25 it was 12 inches high. July 9 it was 18 inches high and had begun to head. July 23 it was 2 feet 4 inches and about half headed. August 6 it was 3 feet 10 inches tall, past blooming, and the grain formed. Soon after the grain was formed this variety was destroyed by chickens. It can be said, however, that it resembles the White Russian in most particulars. Like it it has large, plump grains, but the panicles are small. Its chief fault is a weak straw.

Finland Black.—Seeded May 5 in the same lot with the three last-named varieties. June 11 it was 4 inches high, with a good stand. June 25 it was 12 inches high. July 9 it was 16 inches high, very promising, and had begun to show a few heads. July 23 it was 3 feet tall, fully headed, and in bloom. It was ripe September 5 and harvested on the 13th. This variety was imported from Sweden by the Department of Agriculture in 1897. It is the earliest of the tall-growing varieties, and in spite of its rather heavy straw it stands up well. The grain is of medium size and of grayish-black color, the panicles large and spreading.

Tobolsk.—This variety is one of the Carleton importations. It was seeded on light, gravelly soil May 4. June 11 it showed only a fair stand and was 5½ inches high. June 25 it was 13 inches high. July 9 it was 20 inches high. July 23 it was 2 feet 4 inches high, fully headed, and in full bloom. August 6 it was 3 feet 4 inches high and the grain was formed. It was not ripe until September 15, and was harvested September 29. The imported seed was grown in northern Siberia,



Shock of White Russian Oats, Sitka Experiment Station.

and it ought to ripen earlier than was the case. It stands up well, and is on the whole a promising variety.

Swedish Select.—Seeded May 4 in the same lot with the preceding variety. June 11, 5 inches high; June 25, 12 inches high; July 9, 2 feet high and very vigorous; July 23, 3 feet high and fully headed. August 6 it was 4 feet tall and the grain formed. It was ripe enough to harvest September 15. Only a small sample was grown. It is a handsome variety of oats, but it is not quite early enough. The seed was imported from Russia in 1898.

Zhelanni.—This is likewise one of the Russian importations. Seeded May 4, it was 5½ inches high by June 11; June 25, 12 inches high; July 9, 2 feet 2 inches high and fully headed. August 6 it was 4 feet high and the grain formed. It was ripe about September 8, but not harvested until about two weeks later on account of wet weather. The variety may be of some value for Alaska.

EMMER, OR RUSSIAN SPELT.

Ufa Spring Emmer.—Seeded on light, gravelly soil May 4. June 11 it was 4 inches high. June 25 it was 10 inches high. July 9 it was 20 inches high. July 23 it was 2 feet high and two-thirds headed. August 6, 3½ feet high and in bloom. The grain was ripe about September 10, but was not harvested until the latter part of the month.

The grains are held very firmly in the spikelets and do not separate from them in thrashing. The grain can be separated from the chaff only in the mill. This variety is early enough to mature in Alaska. It has short, white heads and rather brittle straw.

Both this and the following variety of Emmer are of the Russian seeds imported by the Department of Agriculture through Mr. Carleton. It does not seem to possess qualities which would cause it to supplant the grains we already have, even to a moderate extent.

Yaroslaf Spring Emmer.—It is like the preceding in all its characteristics, but rather later and therefore less suitable to the region.

MILLET.

Red Orenborg broom corn.—This seed is also one of the Russian importations. It was seeded May 4 along with the other Russian grains. June 11 it was just showing above ground. June 25 it was 1 inch high, with a poor stand. July 9 it was 2 inches high. July 23, 4 inches high. August 6 it was 8 inches high. By the latter part of August the best of it was a foot high, but showed no signs of heading. It has no value for Alaska.

BUCKWHEAT.

Orenborg.—Seeded April 30. The seed was imported from Russia by the Department of Agriculture. June 11 it was noted that the stand was quite poor; height, 1½ inches, and evidently suffering from the effect of cold weather. June 25 it was 5 inches high and commencing to bloom; it had improved since the warm weather set in. July 9 some stalks were 2 feet high, but the average was only about 1 foot, blooming freely and the first blossoms setting grain. July 23, still blooming some and the first-formed grains ripe. August 25, ripe, but not harvested until September 4. This is the most promising variety of buckwheat that we have so far tested.

Japanese.—Seed obtained from the Central Experimental Farm, Ottawa, Canada. Seeded May 9 on Japonski Island. June 11, stand fair, 1 inch high, stunted by cold weather. June 25, 2 inches high and much of it killed by cold weather. July 9, note is made that the stand is thin and the crop not growing. July 23, what remains of it is 10 inches high and blossoming. August 6, the crop is 18 inches high and blossoming, but no grain forming. This buckwheat never matured any grain. It was a total failure.

Maine.—This variety was obtained from the experiment station in Maine in the spring of 1899. A patch was seeded on new ground in 1899, but it was a partial failure, as was supposed on account of the sourness of the ground. The present year a patch was seeded on May 9 on Japonski Island, and another patch in one of the town lots on May 5. There was practically no difference in the growth of the two seedings; both were stunted in the beginning. June 11 it was only 1 inch high; June 25, 4 inches high; July 9, 6 inches high and uneven in growth; July 23, 20 inches high and in bloom; August 6, 30 inches high, blossoming, and beginning to form seed. The first seed began to mature about September 1. The plants remained green until the latter part of the month. It had formed but little seed. It is not to be compared with the Russian variety above mentioned for this climate.

Silver Hull.—Was tried here at the station in 1898. It produced a rank growth, but no seed.

CORN.

A variety of early corn was obtained from the Minnesota Experiment Station. A small patch was planted May 5. June 11 it was 2 inches high and very yellow. July 9 it was 4 inches high and still yellow. July 23 it was 7 inches high and showed some slight improvement. August 6 the tallest was 1 foot high and had attained to a normal green color. By the latter part of August it was 1½ feet high. It never showed a tassel.

It is very doubtful whether there is any variety of corn which it is worth growing in this country even for feed.

VEGETABLES.

The following vegetables were planted in a cold frame April 19:

Cauliflower.—Extra Early Dwarf Erfurt.

Cabbage.—Jersey Wakefield and Early Winningstadt.

Brussels sprouts.—Improved Dwarf.

Kale.—Dwarf Green Curled Scotch.

Leek.—Large Flag Winter.

Lettuce.—Boston Market.

These were transplanted in the open ground June 18. The soil was fertilized with fish guano at the rate of 150 pounds to the acre and lime at the rate of 1,000 pounds to the acre. Cauliflower and early cabbage began to head by the middle of August, and at the beginning of September there were some nice heads. None came to perfection, however. Those which were not stolen were totally destroyed by the town cattle. The lot was a thoroughfare and gates were left open.

On April 30 the following vegetables were seeded:

Peas.—McLean Advancer, Blue Peter, Earliest of All, Extra Early Market, and American Wonder.

Spinach.—Long Standing.

Onion.—Large Red Wethersfield.

Beet.—Extra Early Egyptian Turnip.

Parsnip.—Hollow Crown.

Carrot.—Half Long Chantenay.

Turnip.—Purpletop Milan.

Of these the peas grew magnificently. The American Wonder produced the earliest peas. They were ready for use about July 20. The vines grew 18 inches tall, which is more than they usually reach.

Earliest of All came next. They had peas ready for use by July 25. The vines were 4 feet tall.

Next came Extra Early Market. Peas were ready for use about July 27. The vines were then about 4½ feet high.

Blue Peter did not have edible peas until August 10. The vines were then 2 feet high. This is a dwarf variety.

McLean Advancer had edible peas by August 16. The vines grew to a height of 5 feet. A very desirable late pea.

The spinach grew about 6 inches tall in a short time and then ran to seed. It was not a success.

The onion seed did not germinate well. Those which grew were stolen as fast as they were large enough to eat.

The beets did well, though the roots were not large. The best were 3½ to 4 inches in diameter.

The parsnips grew as well as they grow anywhere, producing large fine roots.

The carrot seed failed to grow.

The turnips were ready for use by the middle of July. They were exceedingly fine, but most of them were stolen, so they did not grow to a normal size.

The vegetables were grown on poor soil. The results would have been better had the soil been richer. Other people had better vegetables than these were. It has been so fully proven that vegetables can be successfully grown in the coast region of Alaska that it seems unnecessary to give much emphasis to their culture in these experiments. The accompanying illustration (Pl. V) shows a vegetable harvest in the governor's garden.

Fertilizer Experiments with Grain on New Land.

A portion of the land which was cleared last year was plowed for the first time May 12. It is moderately high ground, on which the water does not stand except in an occasional slight hollow. It can not be called a peaty soil, and yet the surface soil is made up largely of decayed moss, and it contains a very large percentage of rotten and disintegrated wood. The stumps were very thick upon the ground, and the smaller roots are not all out. In the process of clearing more or less of the red subsoil has been mixed with the surface soil. Owing to the imperfectly decayed vegetable matter it is a somewhat spongy and porous soil, which does not pack closely, but it holds water with tenacity and can not be worked for several days after a rain. It would at first sight appear to be a very rich soil, and so it eventually becomes when it has been cultivated for some years and frequently turned up and exposed to the action of the elements. But in its virgin state it is almost entirely sterile, owing probably to the presence of free acids in large quantity (it gives a decided acid reaction to blue litmus paper), or to the lack of soluble plant food, or both.

On this land a series of experimental plats were laid out and fertilizers applied according to the following scheme. There were three plats to each series, all three receiving the same treatment, but separate from one another:

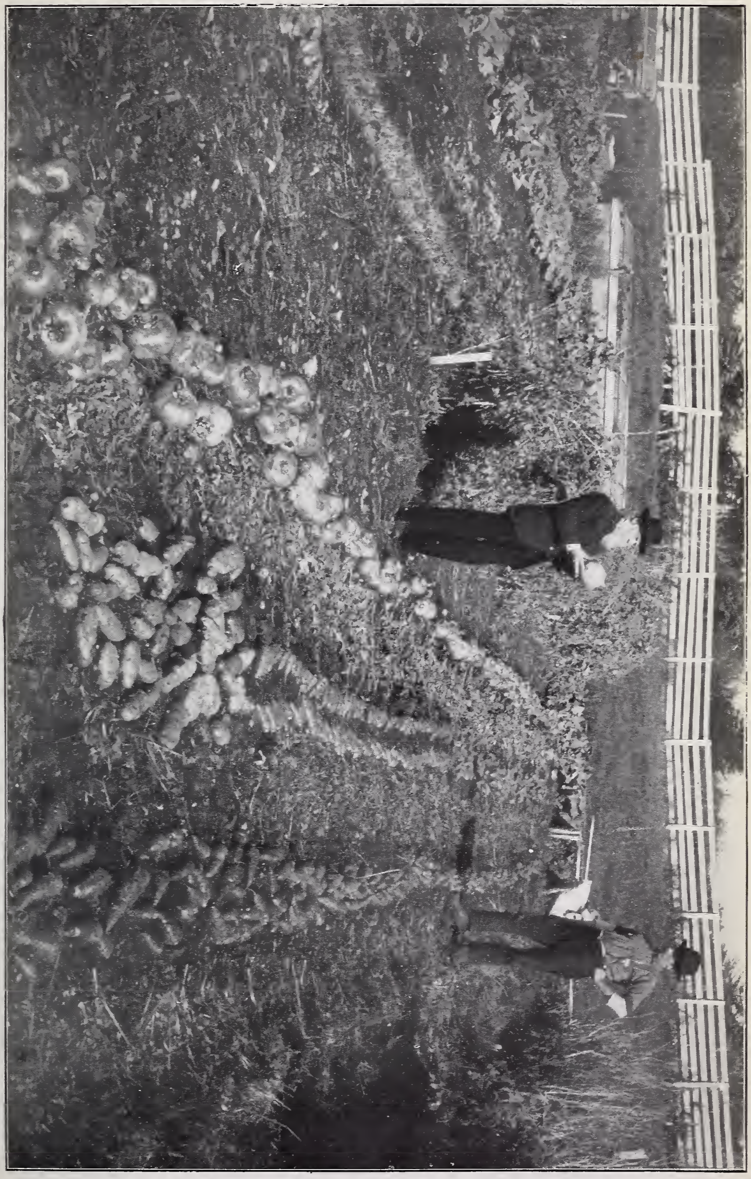
1. Fish guano, 1,000 pounds per acre, and lime, 2,000 pounds per acre.
2. Stable manure, 30 tons per acre.
3. Seaweed, 20 tons per acre, and lime, 2,000 pounds per acre.
4. Stable manure, 30 tons per acre, and lime, 2,000 pounds per acre.
5. Seaweed, 20 tons per acre.
6. Fish guano, 2,000 pounds per acre.
7. No manure.
8. Lime, 500 pounds per acre.
9. Lime, 2,000 pounds per acre.

Each plat was 15 by 20 feet, containing 300 square feet. The fertilizers were weighed out and applied in the proportions as indicated by the above rates per acre.

The guano, lime, and manure were harrowed in as thoroughly as possible. The seaweed could not be harrowed in, but was scattered evenly over the surface and worked in by hand, though it was by no means all covered with soil.

The manure was stable manure, obtained partly from a team of horses owned by a drayman in town, and partly cow manure, but the two kinds were mixed. It was of poor quality, having been exposed

PLATE V.



VEGETABLE GARDEN, SITKA.

to soaking rains all winter and spring before it was put on the ground. Moreover, the bedding used, spruce shavings from the sawmill, appears to be detrimental to the soil, and to some extent neutralizes the beneficial effect of the manure. It was, however, the best that could be obtained, and the rate of 30 tons per acre appeared to be a liberal application.

The guano was fish guano, an Alaska product manufactured by the Alaska Oil and Guano Company, at Killisnoo, Alaska. It is made almost wholly from herring, the oil being first extracted and the residue dried and pulverized. No analysis has been made of this manure. We have as yet no laboratory which would enable us to analyze substances; but it is an exceedingly active manure, and, as the results in these experiments show, it will cause the production of excellent crops on new land which is almost sterile without fertilizers. The seaweed was gathered from the beach, where it was thrown up the preceding fall.

The lime was ordinary air-slaked quicklime of good quality.

The plats as thus prepared were sown broadcast to Manshury barley at the rate of 2½ bushels per acre on May 24.

Under date of June 7 it is noted, "The barley on the farm is coming up nicely; there seems to be no difference now between the fertilized and unfertilized plats."

Under date of July 2, it was noted as follows:

> The growth of barley on the experimental plats ranks in the following order:
> *No fertilizer.*—Two inches high.
> *Limed.*—Two and one-half inches high.
> *Manure.*—Three inches high.
> *Manure and lime.*—Three inches high but slightly more vigorous.
> *Seaweed.*—Five inches high; healthy; stand regular.
> *Seaweed and lime.*—Five inches high; vigorous; slightly better than the preceding.
> *Guano.*—Best, 6 inches high but irregular.
> *Guano and lime.*—Six inches high, vigorous, and uniform.

At this date the weather was dry. There had been only 0.65 of an inch of rain since June 10.

On July 23 it was noted that the barley was practically dead on all the plats which were not fertilized. It grew 3 inches high then stopped growing and died.

The plats which were manured with lime only were poor; the plants averaged 6 inches in height but were very uneven. Some of the more vigorous plants were a foot high and heading out. There was no appreciable difference at that date between plats limed at different rates per acre.

The plats which were fertilized with stable manure were some better than the limed plats, but uneven in height. Some were 2 feet high with good heads, many shorter with small heads. There was no difference between manured and manured and limed plats.

On the plats manured with seaweed the stand was thin, but the height more uniform, averaging 22 inches. There was but little difference between seaweed alone and seaweed and lime.

Plats fertilized with guano were excellent, stand good, plants green and vigorous, averaging 2 feet high, and headed.

Plats manured with guano and lime resembled the foregoing but they were slightly better, although the difference was not great. These were the best looking plats of all.

All the plats were ripe September 15. The plats which were not manured were almost entirely bare; here and there a few spears from 6 to 8 inches tall were found. Some of them had heads with two or three grains, but most of them had no heads at all. It was a total and complete failure as far as the crop on these plats was concerned.

The plats which were limed were slightly better. There was a sprinkling of plants all over them, and most of the plants had diminutive heads. The plants did not average more than 10 inches tall. The amount of lime seemed to have but little influence. The plats which were limed at the rate of a ton to the acre were slightly better than those which received but one-fourth as much, but the difference would not justify the difference in the amount of lime applied.

Next in order came the plats fertilized with stable manure. Those receiving fertilizers at the rate of 30 tons of manure and 1 ton of lime per acre had a better stand than those fertilized with manure alone, but the straw was shorter and the heads very poor, whereas the manure alone produced some fairly good heads but a poor stand.

Next came the seaweed. Here the stand was thin, but the straw was about 3 feet high and the heads fairly good.

Seaweed and lime rank next. This was a fair crop and good heads.

Then follows guano alone, applied at the rate of a ton to the acre. This is, of course, a very heavy application. It produced a very rank growth of straw and the heads were good.

But best of all were the plats fertilized at the rate of one-half ton of guano and a ton of lime to the acre. The bulk of straw was decidedly larger than the guano alone and the heads were much better and more uniform in size.

The accompanying illustration (Pl. VI) tells the story at a glance. Each bundle is the crop from an average plat, except the three smallest; these do not contain quite all that grew on the plat; they were failures.

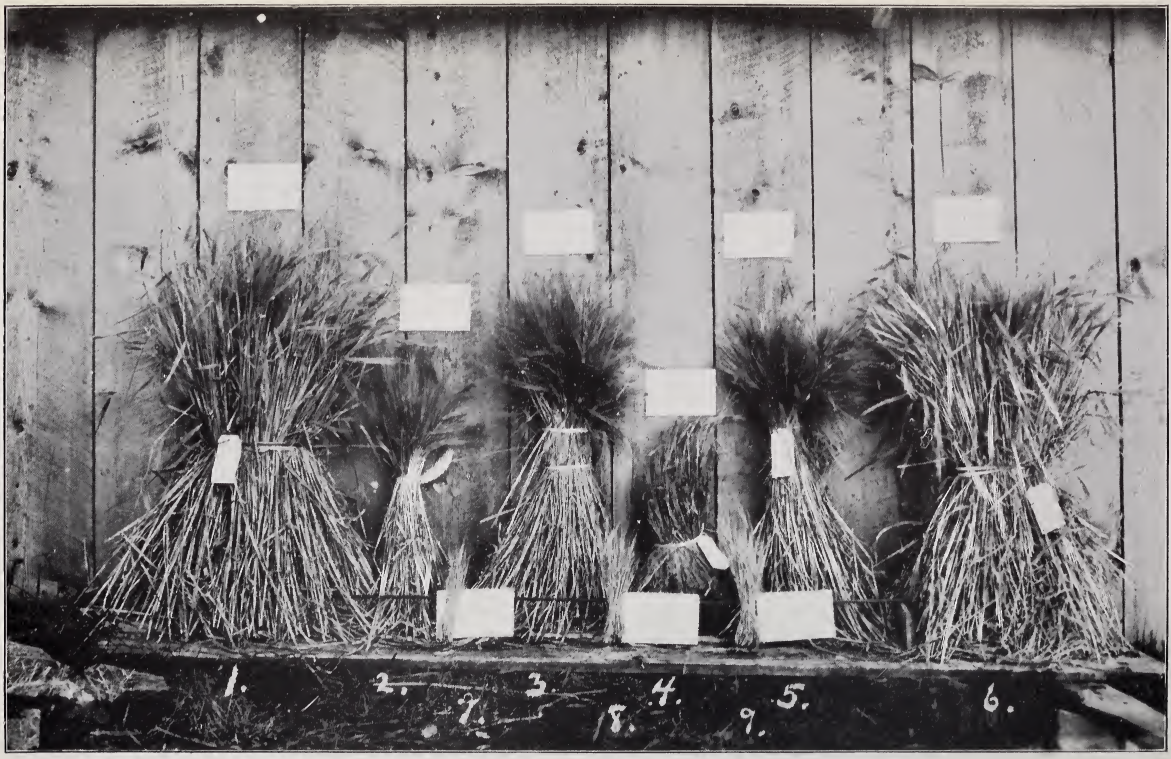
No. 1 is the crop raised on a plat fertilized at the rate of 1,000 pounds guano and 2,000 pounds lime per acre.

No. 2 is the crop of a plat fertilized with stable manure at the rate of 30 tons per acre.

No. 3 is the crop of a plat fertilized with seaweed 20 tons and lime 2,000 pounds to the acre.

No. 4 is the crop of a plat fertilized with stable manure 30 tons and lime 2,000 pounds to the acre.

PLATE VI.



FERTILIZER EXPERIMENT WITH BARLEY ON NEW LAND, SITKA EXPERIMENT STATION.

No. 5 is the crop of a plat fertilized with 20 tons of seaweed per acre.

No. 6 is the crop of a plat fertilized with 2,000 pounds fish guano to the acre.

No. 7 represents the plats which were not manured.

No. 8 represents the plats fertilized with 500 pounds of lime per acre.

No. 9 represents the plats fertilized with lime at the rate of 2,000 pounds per acre.

This experiment is both interesting and instructive. It shows that crops can be raised on new ground when the necessary plant food is supplied. It would indicate that the sterility of new soil is due chiefly to a lack of available plant food, and that the improvement which takes place in the land under cultivation is due to the gradual liberation of the elements of plant food, probably caused chiefly by the action of the atmosphere.

Lime, as it will be noted, had but very little beneficial effect when applied alone, in this case. This does not necessarily mean that the results will be the same in all cases. There are few crops less responsive to lime than barley, and, moreover, the soil was not a peat soil, although it contained an abundance of vegetable matter.

It was a surprise to the writer to find that seaweed had so beneficial an influence, and the results might have been better still if it had been worked thoroughly into the ground. As it was, a large percentage of it was dragged out of the soil in harrowing and left on the surface.

It is of interest to note that the plats which were manured with guano only were, by the close of the season, covered with a growth of green moss all over the surface. This growth was not noticeable on any of the plats that were limed, or fertilized with lime and guano mixed.

Oats on New Land.

A piece of land next to the plats just described was put in shape for seeding just after the spring work was over. It required a little leveling before it could be worked. After it was plowed it was fertilized at the rate of 500 pounds of fish guano to the acre. A strip was fertilized with stable manure of the same character as that above described. Another strip was sown with lime at the rate of 1,500 pounds to the acre over the guano. Thus prepared it was all seeded June 19 to oats and peas mixed, the crop being intended for feed. The seeding occurred too late in the season for the crop to mature and it was not expected that it would. The growth that it made is alone of interest.

The writer has pointed out in former reports that new land was sterile, and it is proved again in the case of the barley experiment detailed above. Oats were sown on new land both in 1898 and 1899 with very unsatisfactory results and there was no reason to expect that there would have been an exception in the present case if no fertilizers were applied. The influence of the fertilizer was, however, as decisive as in the barley experiments. Where the guano was applied, and the guano and lime, the oats grew 4 feet tall, apparently almost choking out the field peas. It was as fine a growth as one could wish to see.

Where the stable manure was applied the oats grew only about 2 feet high and the stand was decidedly thinner.

The accompanying illustration (Pl. VII) shows this field of oats as it appeared the latter part of September. It was cut for hay October 3, at which date the grain was in the milk. It furnished an additional proof of the value of fertilizers on new ground.

Fertilizer Experiment with Potatoes on New Land.

To further test the influence of fertilizers on new land, three rows of equal length were planted to potatoes May 24. One row received no fertilizer whatever; another row was fertilized with seaweed, a furrow being opened with the plow and the seaweed scattered along in it and trampled down. The potatoes were dropped in the furrow on top of the seaweed and covered with soil; the third row was fertilized with guano and lime at the rate of a ton each to the acre. They were applied to the surface and not in the furrow.

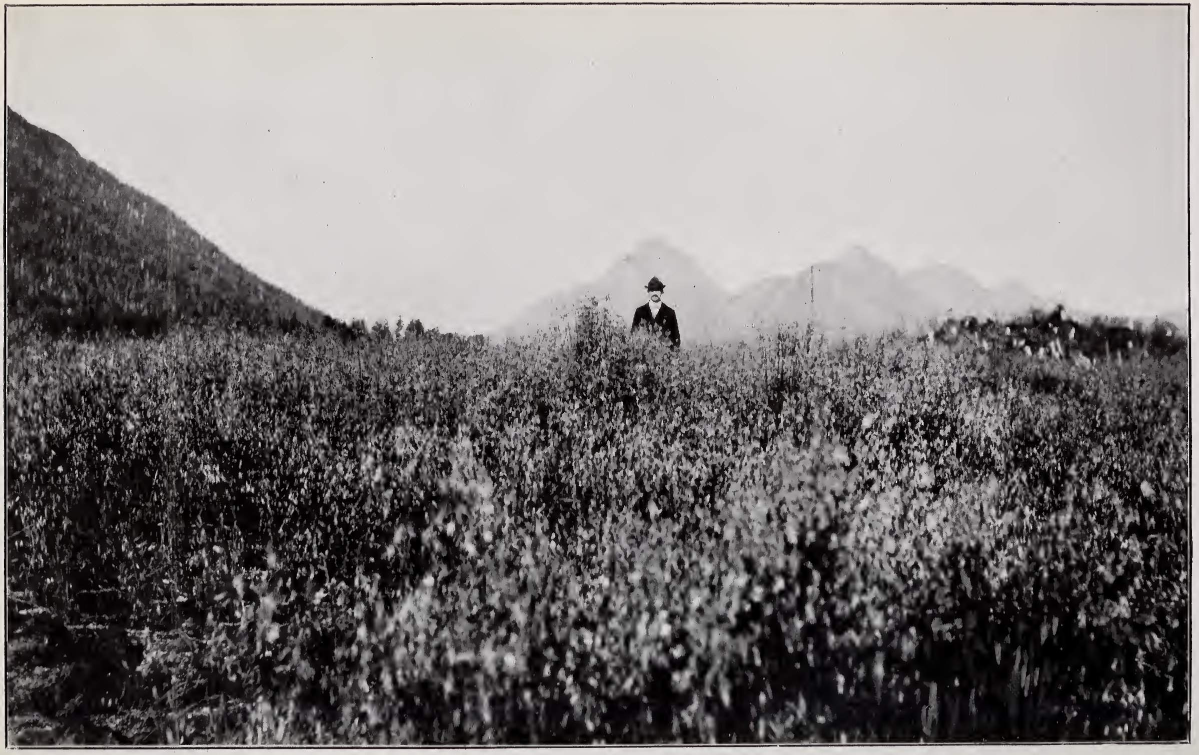
The Burbank potato was the variety used. The results are best shown in the accompanying illustration (Pl. VIII). The three piles contain all the potatoes found in the three rows, respectively. No. 1 is the product of the row fertilized with guano and lime. No. 2 is the product of the row which was not fertilized. No. 3 is the product of the row fertilized with seaweed.

The unfertilized row, it will be noticed, has scarcely more than a double handful of potatoes, none of them larger than walnuts, and most of them not larger than hazelnuts.

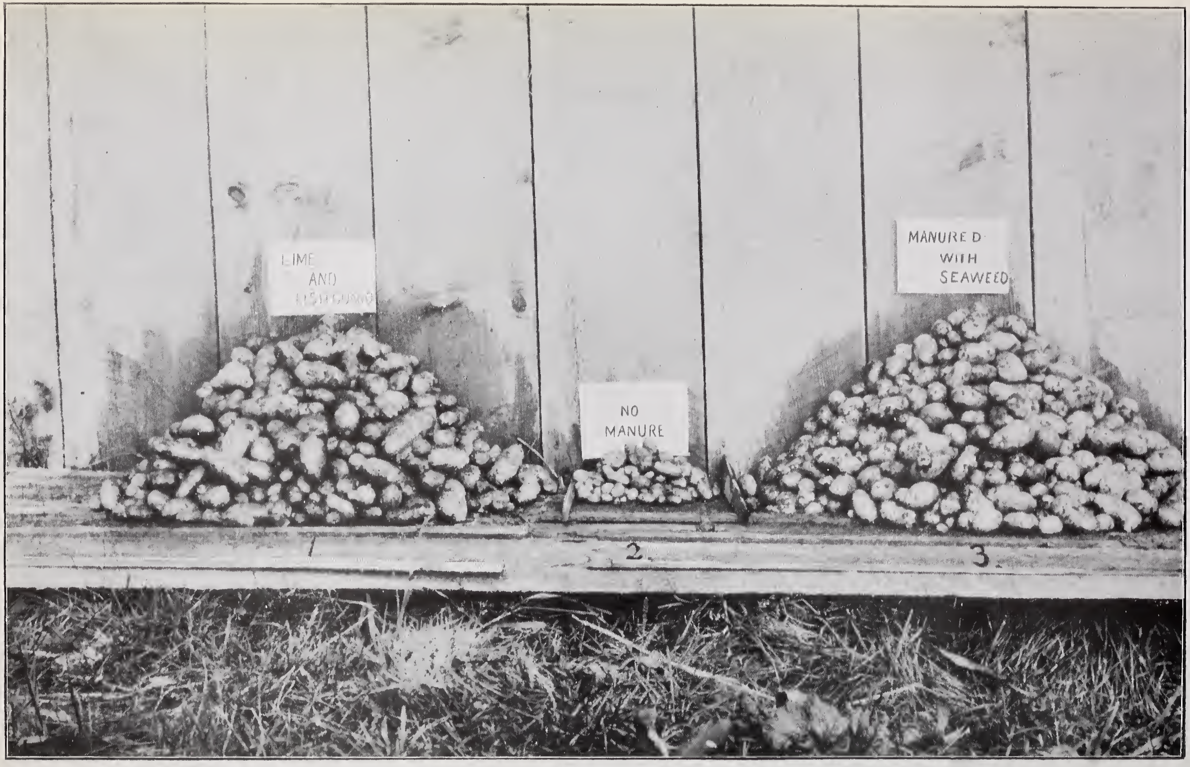
The guano and lime produced a fair crop, in which about 50 per cent were of marketable size.

The seaweed produced a still better crop, there being decidedly more potatoes, but they were smaller and the proportion of marketable potatoes was smaller, fully three-fourths being too small to be classed as such. But the comparative yield is of much interest. It is a valuable proof of the value of fertilizers on new land.

The fact that crops can be grown on new land by the application of fertilizers is the all-important point. We know now that pioneers can raise crops from the start. The discouraging sterility of new land can be overcome. This one fact is, at this stage of the agricultural development of Alaska, secondary in importance only to the fact that grain will mature here at all. Three years ago nobody believed that grain of any kind could ripen in Alaska, but, although there are still



FERTILIZER EXPERIMENT WITH OATS ON NEW LAND, SITKA EXPERIMENT STATION.



FERTILIZER EXPERIMENT WITH POTATOES ON NEW LAND, SITKA EXPERIMENT STATION.

some doubters, the experiments of the past three years have proved that this can be done, and it can be done with a large range of varieties of all the leading grains. The discovery that new land can be made fruitful is another step in advance toward making agriculture successful in Alaska.

Seaweed as a Fertilizer.

Seaweed seems to be a most valuable fertilizer for this land. It is a material which can be gathered in almost unlimited quantities anywhere along the shores of the entire coast region. Alaska farmers would do well to gather this material in the fall, when it is torn loose and washed ashore by the equinoctial storms. It can either be scattered and plowed under at once, or else thrown into piles and hauled onto the land and plowed under in spring. A fertilizer which can be so easily obtained and which has so decided a value should not be allowed to go to waste, wherever it is practicable to save it. We shall undertake further experiments with its use as a fertilizer.

Repairing Launch.

The steam launch *Wave*, which was turned over to the Department of Agriculture last spring by the Navy Department, and eventually assigned to the Sitka Experiment Station, has been repaired to such an extent that it can be run. The total expense for repairs was $115. It consisted in putting in a new smokestack, new piping where needed, a thorough cleaning of the boiler, overhauling the engine, cleaning the hull both inside and out, and giving her two coats of paint on the outside. The boiler was tested as to its working pressure and found safe. The hull and machinery are old, but reasonably sound. Though the machinery is a great deal the worse for wear, with careful handling the launch may be considered safe in fair weather and on a smooth sea. The machinist work was done by Mr. Rader with such assistance as could be secured.

As we were ordered by the commanding officer of marines to remove her from the mooring to which she was fastened while belonging to the Navy Department, we had also to construct a new mooring and float for her, which was placed in front of the upper part of the Indian village.

The launch has been of great value already. We could not have filled the silo without her.

Building and Filling of Silo.

Mr. Rader built a log silo during the summer. It was located near the cleared land on the south side of a little knoll. The building is set into the hillside so far that there is a bank of earth about it about

6 feet high at the rear. A road leads over this bank, and thus in filling the silo the grass can be thrown over the top beam with a minimum amount of labor.

The silo is built entirely of logs, except the roof, which is of common native spruce boards. The inside dimensions are 15 by 15 feet and 13 feet high. The logs are fitted with much exactness, each log being hollowed on one side to fit the rounding part of the one underneath it. The cracks between the logs were filled with moss, a layer about one-half inch thick was put on top of each log before the next log was put in place. The weight of the logs squeezed this moss very tightly, and after the building was completed additional moss was driven in with wedge-shaped sticks until the cracks were completely filled. The logs were hewn on the inside so that the walls are smooth. There is a small door in the gable on the end facing the hill through which the grass is put in. On the south side there is a door at the bottom from which the silage is taken out. The floor is simply the gravelly clay encountered in laying the foundation. This was tramped and packed as closely as possible.

A temporary shed which is used as a stable for the oxen is built on the south side.

The illustration given herewith shows this silo and shed. (Pl. IX, fig. 1.)

The writer believes it would have been better to have built the silo with the walls flaring outward. It would be possible to do this when logs are used as the material of construction. The silage in settling would not then shrink from the walls and admit the air. On the contrary, it would press more and more firmly against the sides as it settled. This is an afterthought, however, and if we have more log silos to build it would seem advisable to try it.

The silo was filled during the latter part of September and the beginning of October. This is probably a little later than is desirable, as the grass is then past its prime. In filling, the grass was simply thrown in and trampled well. In taking the silage out, a small block at a time is cut down with a hay knife; in this way it is not at all difficult to get out. The silo is filled entirely with beach grass (*Elymus mollis*). This grass grows in patches, here and there along the beach where it has not been driven out by the spruce. It appears to be a valuable grass for cattle feed; although it is very coarse, it is succulent and not wiry. Cattle eat it greedily. It remains green until cold weather.

The silo is proving to be very satisfactory. On November 10 we opened it and found the silage first class. No covering had been put on the grass when it was put in and there was a layer on top about 6 inches thick which was spoiled. There is also a little spoiled around the sides, due to the admission of air as the silage settles, but the waste will be slight.

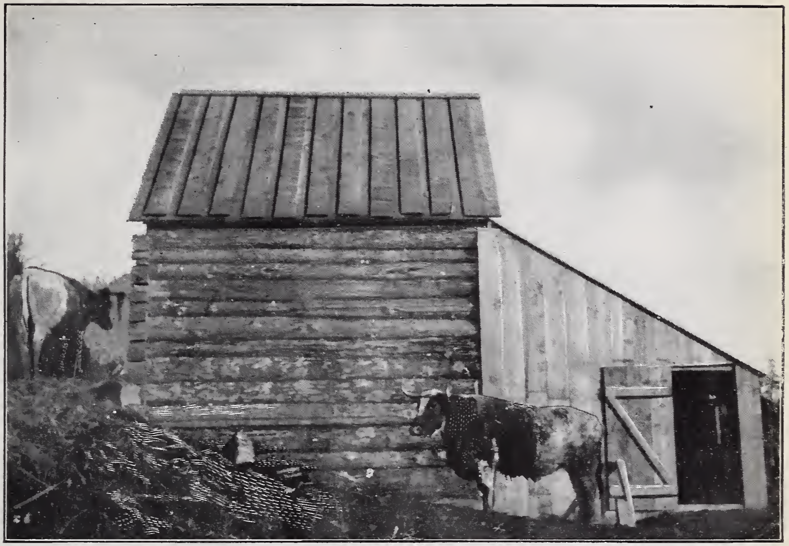


Fig. 1.—Log Silo and Cattle Shed, Sitka Experiment Station.

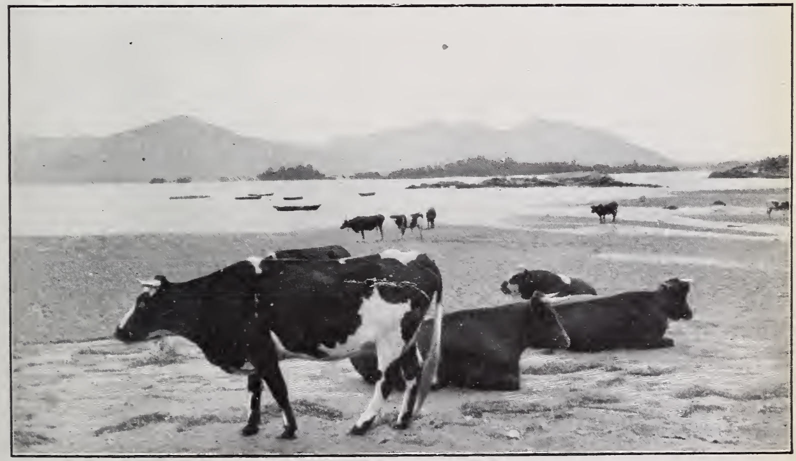


Fig. 2.—Cattle on the Beach at Sitka.

WORK AT KENAI STATION.

Owing to the infrequent and imperfect mail service between Sitka and Cook Inlet, I have, at this writing, not received the final report for the season from the superintendent of the Kenai station. I am, therefore, unable to state definitely just what has been accomplished or the results of our experiments there. It takes letters a month and sometimes more to reach Sitka from Cook Inlet. The south-bound mail steamers do not stop at Sitka, but go on to Juneau and leave the mail, and it is then usually brought here by the next mail boat from Seattle.

Owing to the lack of funds, Mr. Nielsen has worked much of the time alone, and he has had only one man to help him when he has had any help at all.

From the letters he has sent to headquarters from time to time I gather the following facts:

The month of April was cold and stormy, and aside from the seeding of the cold frames about the middle of the month, no farm work was done. Under date of April 25 Mr. Nielsen writes that the plowed land was covered with water and slush snow 6 inches deep, and the ground under it was frozen. This flood of water, snow, and ice killed all of the fall-seeded rye and wheat completely.

Having written Mr. Nielsen early in April that he could not hire any labor before an appropriation should be made, he writes as follows under date of May 15:

> The labor question leaves me in an awkward position. I have been doing everything myself so far and will be able to get along another week, but when the ground gets warm and dry enough to begin seeding I can scarcely get the work done on time without help. The man I thought of hiring left here about three weeks ago. He and all the other white men, about thirty in number, went down to Homer to work for the Cook Inlet Coal Company, where they are paying $2.50 per day and board. Under the circumstances I shall have difficulty in hiring men at $50 per month and they board themselves. If I do not find a white man who will work for that, I will try to get along with a native. Natives can be hired for about $1 a day and board, or $1.40 per day and they board themselves, but they are very poor help. I understand your outline for the experiments this summer, and shall do my best to get satisfactory results, whether I get help or not. I ditched a part of the field to-day. It is too wet yet to work up well.

Under date of June 4 Mr. Nielsen writes:

> Your letter of May 8 was received May 21. I see by it that no appropriation has been made up to that date and that I, therefore, can not hire any help as yet. The matter is much simplified now. There are no laborers to be hired. All the able-bodied men who were left, both white and natives, are engaged in fishing for the summer.

WEATHER CONDITIONS AT KENAI.

In regard to the seeding he writes as follows under the same date:

> I began seeding May 21, and have put all the seed in, but it is getting very dry; nothing is growing. We have had only 0.37 of an inch of rain since the 1st of May, and none at all in the last two weeks. We had a frost one night in the latter part of May, which injured the cabbage and cauliflower which I had just planted out. I shall begin clearing ground again to-morrow, and this will be the general order of the day hereafter except when the crops need my attention.

In response to my request Mr. Nielsen wrote the following letter, under date of August 13, in regard to the work at the station and condition of affairs up to that date:

> From November 1, 1899, to March 1, 1900, no work was done on the station, as I was hired only to take care of the yoke of oxen belonging to the Government.
>
> On March 1, 1900, the snow was still lying about 14 inches deep on the level, and so remained until the 16th of the month, when the first thawing weather came. The snow all disappeared in three days, leaving water everywhere, and, as the ground is nearly level, the next two weeks were spent in cutting ditches in the frozen ground to lead the water off the cleared land.
>
> April was cold, cloudy, and rainy, so that the ground thawed very slowly. Nothing could be done except to get everything ready for spring work. Early in May the manure which had accumulated at the barn was hauled out and spread on the field. At this time the ground was thawed out about 6 inches deep, but as the soil underneath was frozen and no provision had as yet been made for drainage it was too wet to be worked.
>
> During April and the first two weeks of May I cut and cleared off trees on about 1½ acres of land, leaving the stumps and brush, which could be pulled out by the roots when the ground thawed sufficiently.
>
> The winter wheat and rye sown in August, 1899, were killed by the water which collected on the surface of the ground when the thaw set in. All that could be done was done to lead the water off, but the ground under the grass and moss was frozen so hard that ditching was slow work. It had to be done with an ax.
>
> The field was disked twice before seeding; once on May 16 and again on the 20th, and harrowed once on the latter date. May 21 I began sowing the field grains. Several varieties of barley, buckwheat, flax, emmer, oats, and wheat were put in during the next ten days. Nearly all the seed sown sprouted and came up in from twelve to eighteen days.
>
> After seeding I again turned my attention to the clearing of land. The stumps and brush left from where I had cut the trees earlier in the season were now grubbed out and hauled off. The land was plowed, disked, and harrowed the last week of June; it has been disked several times since and is now ready for seeding to winter rye and wheat.
>
> A house for the station superintendent is under construction; the foundation posts have been set, but as instructions for building the house were received after the snow had melted, it has been impossible to get logs out to carry it any further this summer. Logs will be gotten out this fall and winter and the house completed early next spring. A cave for storing potatoes and turnips has been constructed this summer.
>
> The crop outlook is not so promising as it could have been, owing to the dry weather in the early part of the season. Some varieties of barley, oats, and buckwheat are in bloom and may mature. All the varieties of wheat are just heading out and it is doubtful if any seed will be obtained from them. These crops lost

nearly a month by the dry weather; they did not grow at all during the drought. Potatoes are doing fairly well, but most of the vegetables have been stunted by the dry weather. Cabbages, however, are heading up nicely, and the peas are large enough to use. Beets, carrots, parsnips, turnips, and ruta-bagas are small and will not be very large at the best.

The crop outlook improved somewhat in the latter part of the season. Under date of September 2 he writes as follows:

I have a grain field here that I feel proud of, and I believe I have a right to. Things looked very dubious, and I even believe that I began to wear a discouraged expression for a while, but last month, with nearly 4 inches of rain and warm weather, things began to spread themselves. The question as to how many of the varieties will mature depends entirely on how soon we get a killing frost. It is to be expected any time now, but may hold off for a week or ten days yet.

The Norway barley is very fine. I have a plat, 20 by 50 feet, sown from seed raised here last year and it is out of the milk now and turning yellow. The other varieties of barley are in the milk at this time. Burt Extra Early oats from the Minnesota Experiment Station proves to be the earliest oats and bids fair to mature in good shape.

We have cleared about 2 acres more land this year adjoining the piece we cleared last summer, making about 5 acres in the southwest corner of the reservation.

Under date of September 20 he writes:

I have to-day cut and gathered three small plats of barley. The varieties were the Norwegian, the Russian, and the Manshury. They were raised from seed which matured here last year. We have so far had one frost. It killed the potato tops, but everything else is growing nicely yet.

Some days later Mr. Nielsen forwarded a few sample vegetables from Kenai, which were very fine. They consisted of beets, turnips, kohl-rabi, ruta-bagas, cucumbers and a head of cabbage.

Mr. Nielsen writes further that our work there has done some good already. Small gardens around the houses are much more numerous than last year. Several persons are talking of starting gardens, and those who have only small ones say they will enlarge them next spring.

AGRICULTURAL POSSIBILITIES OF THE COPPER RIVER COUNTRY AND PRINCE WILLIAM SOUND.

The following interesting observations on the Copper River country and Prince William Sound are furnished at my request by Mr. George Sexton, a census enumerator, Twelfth Census, who spent the summer in these regions. Mr. Sexton has had a wide experience in practical farming, and should be a competent judge of the subject on which he writes:

THE COPPER RIVER COUNTRY.

From an agricultural standpoint this is a country of surprises. Beginning at Valdez, we find the most luxuriant gardens grown within 2½ miles of the glacier. Potatoes the choicest, the finest cabbage, turnip, beet, carrot, parsnip, celery, and in fact everything in the garden line was fine. The garden of Mrs. D. Von Gunther and her outdoor flowers, grown from southern seeds, was the wonder of the season.

The entire trip from Valdez to Mantasta Pass is bordered on every side with large tracts of level land, easy to clear and cultivate, the elevation ranging from 600 to 1,800 feet above sea level. After one gets over the summit, and, say, 100 miles beyond, one can get large tracts of farm land. Of course I shall be branded as an agricultural enthusiast, but I want to go on record as predicting that wheat can be grown in the Copper River Valley up to an elevation of 1,700 feet, and ripen in an ordinary season. With a good deep soil and clay subsoil, with an average temperature of 100° F. in the daytime and 60° at night during a part of the summer, this wheat can be ripened and harvested, as can any other cereal. Grasses grow in abundance on the coast ranges even at an elevation of 2,500 feet. I planted some oats on the night of July 4, and, returning on September 22, I found the oats had fine large grain past the dough, or beginning to ripen, only eighty days from planting, but there was plenty of sun crowded into this short space of time to grow and ripen almost any cereal. When it comes to acreage, it can be found in abundance, with plenty of timber to fence with.

Forage for stock.—From the 1st of June until the 1st or middle of October there is plenty of forage. All along the trail redtop and bunch grass grow, some of which is as high as a man's shoulder. Redtop is found on the table land as high as 1,500 feet above the sea level, and in protected spots as high as 3,000 feet, and bunch grass as high as 4,500 feet. The only difficulty we experienced in feeding our horses was that sometimes we had to make long forced marches to get from one feed patch to another. Horses did well on the grass until the frost killed it. Cattle turned out in the spring were brought into Valdez the 1st of October and slaughtered, and finer beef was never put on a butcher's block.

Wild berries.—We found black and red currants, blackberries, salmonberries, and red raspberries in abundance, besides high and low bush cranberries, and grouse berries. These we found to be great luxuries in the abscence of cultivated fruits.

Game.—Black and cinnamon bear, moose, cariboo, big-horn sheep, mountain goat, grouse, ptarmigan, mountain lion, lynx or wild cat are all found in this region.

Fish.—There are grayling and some few trout, but salmon are in abundance in the Copper River and as far up as the Tonsina; from that up they seem to be scarce.

PRINCE WILLIAM SOUND.

The agricultural possibilities of the islands in and around Prince William Sound are as yet not very well known, but sufficient has already been done to prove that anyone who desires can raise all the vegetables used to maintain a family with very little effort, and the cereals can all be grown in abundance. There is plenty of tillable land on these islands for all garden purposes. At Virgin Bay and Tatekluk there are at least 10,000 acres that can be used for agricultural purposes, and many a hundred-acre tract can be found on the many islands and peninsulas of these waters.

KUSKOKWIM RIVER VALLEY.

Mr. John Lyons, of Juneau, Alaska, special agent Twelfth Census, spent a portion of the past summer in the Kuskokwim and Nushagak river valleys and adjoining regions, in connection with his census work. He kindly gave me a verbal description of the country he had passed through, and of its resources, especially those relating to agriculture. Going up the Kuskokwim, he stopped first at Bethel, a Moravian mission some 125 miles from Behring Sea, in about latitude 60° 38′ N. Here he found a good garden, well stocked with all the common vegetables, which seemed to do well; but no effort had been made at farming. Nor had they any live stock. He was of the opinion that cattle would do well there. The climate is not severe, and grass is abundant on every hand. There were many prospectors in the country, but few permanent settlers, aside from the missionaries. Natives are numerous all along the river. An epidemic resembling la grippe had, however, been fatal to about 25 per cent of them during the past summer.

Mr. Lyons went up the river about 250 miles to a place called Ogavik, where there is another Moravian mission. The valley of the river averages 60 or 70 miles in width. There is good pasture all over this immense region, though in places it is swampy. There is little tree growth until the mountains are reached, but there is good timber in the mountain valleys. From Ogavik he crossed over to the Yukon with two natives through a chain of small lakes and connecting streams. Most of this lake region is covered with tundra, and not well suited for farming, though it will afford much pasture in places. Nearly all of Kuskokwim River lies between latitudes 60° and 62° N. There is no reason why agriculture should not succeed here, when grain ripens on the Yukon three or four degrees farther north.

Mr. Lyons also visited the Nushagak River, but did not go above Carmel, a Moravian mission at the head of the bay. Here he found splendid gardens, and the settlers also kept hogs and poultry, but no cattle. There is comparatively little agricultural land in the valley of the Nushagak.

As a matter of interest he stated that this river affords, perhaps, the finest salmon fisheries in the world. There are 15 canneries in the mouth of the river, and each company takes an average daily catch of from 1,500 to 4,800 cases, according to capacity, for two or three months every summer.

It is highly remunerative business. A plant which cost $60,000 expected to pay for itself the first season.

REPORTS FROM SETTLERS.

A few reports have been received from settlers in various parts of the coast region in regard to their gardening operations. It has been so fully demonstrated in my two former reports that vegetables can be grown successfully in Alaska that it is scarcely necessary to dwell at length on this subject. When failures occur they are due more to poor soil and poor seed than to an adverse climate. It also requires some skill on the part of the cultivator to meet the conditions which confront him, skill which can be acquired only by experience, and it is therefore not strange that failures occur. New sour soil, which often needs drainage, and which is almost certainly lacking in available plant food, is in most cases the cause of unsatisfactory results.

POTATOES DID WELL AT SUMDUM.

SUMDUM, ALASKA, *October 5, 1900.*

DEAR SIR: As the season is now closed I send you my report. Potatoes did well. I raised about 250 bushels to the acre. Peas (Abundance) did fine, growing about 7 feet high, full of pods, and stood the frost well; other varieties were not so good, but the Purple Top turnip got very large and fine. Cabbage did all right, heads were small but solid. I have started some strawberries; they seem to do all right.

I have a team of horses and expect to put in a large crop next year. I have put up about 5 tons of red-top hay. Would this coarse grass do for silage? Come and make me a call next year; will be very glad to see the reports of your experiments.

Yours, truly,

C. F. STITES.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

LARGE POTATO CROP AT HAINES.

HAINES, ALASKA, *November 8, 1900.*

DEAR SIR: Last spring I received a package of seeds from you which I distributed to any who wished them.

The silver-hull buckwheat I gave to E. B. Clark, who sowed it, but his hens got into the patch and destroyed it all.

Turnips and ruta-bagas of all kinds came more nearly being a failure with us than any year since I have been here, and yet I raised a ruta-baga that weighed 12½ pounds, but it was not very nice.

Cabbage, carrots, and even peas were not as good as usual, but Egyptian beets surpassed any beets that I have ever raised here, many of them attaining the size of 4 inches in diameter.

Potatoes, however, did better for me than ever before. On June 15 I planted a piece of ground 48 by 100 feet with a mixed lot of potatoes, and September 26 I dug and weighed one potato that weighed 1 pound 7 ounces, and another that weighed 1 pound 9 ounces. October 16 I finished digging, the vines having been killed about October 1. At that time I weighed 2,152 pounds of selected potatoes from nearly twelve of the fourteen rows which constituted the patch, and had besides three or four sacks of small potatoes which had not had time to grow larger than a good-sized hen's egg. I feel safe in saying that my ground yielded at the rate of something over 500 bushels per acre. August 1 I began using the young potatoes and used them every day thereafter, the largest on that date being nearly the size of goose eggs. I saw one potato raised by Mr. E. B. Clark that surpassed in size anything I raised, although I do not think any garden around here produced a larger average yield per acre.

Although the season opened a little earlier and kept open a little longer than usual, it has not proved to be an average season for gardening, as we had but little rain when most needed.

It may be of interest to add that we had all the pie plant we needed for a family of 10 persons from seven hills. We also had a nice little crop of red and white currants, and 6 quarts of gooseberries from one bush.

Yours, truly,

(Rev.) W. W. WARNE.

Prof C. C. GEORGESON, *Sitka, Alaska.*

NEAR MUIR GLACIER—INTERESTING THE NATIVES.

HOONAH, ALASKA, *October 13, 1900.*

DEAR SIR: I have received seeds from your office the last two seasons, and as I failed to report a year ago I will now relate my success.

My efforts have not been brilliant, as press of other work has forbidden giving proper attention to gardening, and the ground has not been in suitable condition.

One patch which I planted was mere gravel and unfertilized, while the other, naturally fertile, was too much in the shade. I hope by another year to make a better report, as I have witnessed the effect of herring fertilizer and have put it on my ground.

We have so much snow here that the ground is slow to come into condition for planting, the fall for the past winter, 1899-1900, being about 4 feet, and 7 feet for the winter preceding.

Our first planting was done the first week in May and the last the 19th. The last planting did equally well with the earliest. One great drawback to our gardening was drought for about a month or longer in June and July. But despite all drawbacks we had excellent success with lettuce and peas. Better quality was never grown, and the peas are still blooming, although we have had ice some time ago. Carrots have been our best paying crop. We raised several bushels, the largest weighing almost one-half pound. I have not gathered our parsnips yet, but they have done quite well, and are about 1 inch in diameter. Turnips did not amount to much, although some of the natives raise fine ones. Radishes are worthless. Seed onions grow as big as marbles, but by setting out the mature bulbs, which were half rotted, we had fine tops for early eating before they were half seeded. Beets have been almost worthless, and likewise cabbage. Kale grew 18 inches high, but as none of us had seen kale before, we don't know whether that is a crop or not. Parsley has done well. Ruta-bagas are about like turnips—only a few large enough to eat.

I planted some buckwheat, but a frost caught it in full bloom and killed it; some of it had matured. I planted a few potatoes very late, and they were also killed by frost—not much of a crop—but I bought some nice ones from a native to-day. I think they can be grown all right. Spinach was a total failure. Three little gooseberry bushes were as full as they could hang of the very finest berries. We have no other cultivated fruits, but the woods are full of wild fruits.

We have been trying some chickens this summer, and have sixteen nice little ones, which now suggest a fry if they continue to escape the dogs.

We are pretty close to the great Muir Glacier, but, in spite of the early and late frosts which that will send us, I am confident that a great deal of successful farming can be done here.

You asked me to send you a list of permanent settlers here who would be interested in the development of agriculture. I should like to send your reports to some of the natives, whose names I give herewith, in the hope of arousing their interest. I hope also to send a list of names to you next spring of those whom I can incite to try agriculture. I am hoping for a rapid change to come to these people, and farming will be one of the instruments to effect the change.

Respectfully,

Wm. M. Carle.

Special Agent, Department of Agriculture,
Sitka, Alaska.

ROLL BROTHERS' GARDEN.

Hope City (Cook Inlet), Alaska, *August 13, 1900.*

Dear Sir: It gives me pleasure to report our success in gardening the last year (1899).

We have grown the last three years the following vegetables: Cabbage, turnips, ruta-bagas, radishes, potatoes, lettuce, and beets. The above-named vegetables produce an average crop as well as in the States. Carrots do not get very large, on account of the shortness of the season—4 to 6 to the pound. Peas also do well. We have planted three or four varieties. First and best are McLean Little Gem, the American Wonder, and Tom Thumb. The last named yielded better than any of the other varieties, but not so early. Cauliflower grows as well here or better than in a good many of the States. Onions are a total failure so far; the so-called potato onion might do better. Beans will produce a small crop—will only make string beans for a short season.

Most respectfully,

ROLL BROTHERS.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

EIGHT-POUND CAULIFLOWERS AT NUSHAGAK.

NUSHAGAK, ALASKA, *September 4, 1900.*

DEAR SIR: In May, 1899, I wrote to the Department asking for some cauliflower and other seeds. I received the seeds July 20, 1899, but it was too late to do anything with them. I thought it best to wait until this year before writing about them. This year I again received a package of seeds. Very many thanks for all of them.

Last year I planted some cauliflower seeds that were sent to Rev. S. H. Rock in 1897. It was the Early Dwarf Erfurt, but my experience with it was that it was not very dwarf. I had quite a number of heads that weighed 7 pounds, and two that weighed 8¼ pounds each and measured 37 inches in circumference, and beautifully white. All who saw them said they had never seen such cauliflower. I also had some Early Jersey Wakefield cabbage, and most of the heads were a very good size. There were quite a few that were over 8 pounds, but last year the trouble began; and this year is very much worse, namely, that so many worms get at the roots. Is there not something we can do to prevent this? I saw permanganate of potash recommended, so I tried that; then we tried wood-ash lye, and lastly salt brine, but the latter proved fatal to quite a few plants, but we find that it has not exterminated the pests. We have tried some lime, but it has not been very successful either. Of course, not all our plants died, but most of them; and the seed sent last year—Early Snowball—is, I suppose, a smaller variety, so between that and all the doctoring the plants got, the heads are rather small.

Our ruta-bagas are almost a failure, but some of the turnips have grown to quite a good size; very many are destroyed. Kohl-rabi has done very well. We had the purple variety this year; next year we expect to try the White Vienna, as they are said to be better. Last year we had a fine crop of peas. I planted the Dandy and American Wonder from Mitchell's, Philadelphia. We have the same kind of seed this year, but the peas are very slow in maturing and we are likely to have very few.

Cut lettuce does very well; head lettuce not quite so well. The heads are not as large as those at home. Last year our self-blanching celery was fine, and our parsley has always been beautifully double.

Flowers seem to do best for me. Pansies I have of all colors and very large; the plants are full of flowers. Nasturtiums also have done very well. Mignonette grows better for me here than in Philadelphia. Poppies, both double and single, do well. Sweet alyssum does very well, too; blooms profusely. Asters have not done as well this year as last. Phlox does well; full of flowers. Corn flowers do well, too. I have tried morning-glories and lady slippers on the Kuskokwin and here, but they never came to anything.

Now, if you could only tell us something to do for the cauliflower, cabbage, and turnips, we will be very grateful. To have about 100 heads of cabbage spoiled just after it has headed or grown a little is very trying. Turnips are so very good for the scholars that we feel very badly to lose all of them. This year very much of the kale has been spoiled. Last year it grew so large and thrifty and was enjoyed so much after all our other greens were gone.

It is rather hard on us, too, because the native believes the seed has something to do with it, and we are anxious that they shall try to raise some vegetables for themselves.

Very truly, yours,

(Miss) P. C. King.

Prof. C. C. Georgeson, *Sitka, Alaska.*

[The surest remedy is to change to fresh ground for about three years, and in the meantime keep the ground fallow. Break it up in the fall and let lie in rough furrows over winter.—C. C. G.]

GOOD GARDENS AT CARMEL.

Carmel, Nushagak, Alaska, *September 4, 1900.*

Dear Sir: Since my husband, the Rev. S. H. Rock, will not have time to write an account of our success with the seeds you sent us last year, he has commissioned me to write for him. I have for ten years taken an active interest in our two large gardens.

When I came here in 1890, and for about five years after that, we raised very fine turnips, but could never raise full-grown potatoes. In 1896 my father sent us from the East some seed of the Early Ohio potato. It yielded remarkably well. We saved all of the best ones for seed and since then have been very successful in raising potatoes. The crop last year was particularly fine, some weighing 2 pounds and many over a pound. They are more crisp and sweet than potatoes grown in the States and quite as large. We plant in narrow beds two or three rows wide and raised about a foot higher than the paths, and use pig and chicken manure as a fertilizer. The soil is rather thin and needs a fertilizer.

The kohl-rabi was very large and fine this year, and the cauliflower was nice but quite small compared with those we had last year.

We tried the buckwheat. It blooms, but the seeds do not develop. The wheat heads are empty, too; at least many of them. The wheat was taken out of chicken feed because we had none better. There were a few grains of oats and they grew up very fine and have better heads than the wheat. Corn taken from the chicken feed grew about a foot to 18 inches high and is turning yellow. We planted the grain rather late because the only ground that could be spared was in a part of the garden where the frost remains a long time in the ground. Besides, soon after the seed was put in the ground we had a severe drought and the seeds refused to sprout and grow for weeks. You see, they had an unfortunate beginning.

We have pigs, chickens, and expect a cow and a young bull next spring. It is important that we should be able to raise food for the stock. We can not afford to import all the necessary food.

Our great difficulty here is the dogs. There are quite a few white settlers on the river; most of them have teams of dogs, and the natives have quite a few, too. No living creature is safe unless securely corralled; neither is cultivated ground safe unless the dogs are fenced out. They tear around and ruin the vegetables, dig holes, lie on the beds, and make havoc generally. Fencing is so very expensive. New wire webbing was offered us at $18 per 50 feet. That is enormous; we can not pay it. Mr. Rock is making a picket fence out of native sticks, but it is slow, laborious, and expensive work.

We raise onions for the sets, but have not yet succeeded in producing anything of an average size larger than a walnut; usually much smaller. Red beets get about as large as the onions, a little larger, perhaps. Sugar beets we have never tried. Kale gets real nice if we set it out early, but the worms bother it. The worms are destructive to ruta-bagas, but some always survive. Last year we had pretty good celery, from 1 to 2 feet high, but we set it out too late this year. Peas come late, but we get quite a few before frost comes. Cut lettuce lasts all summer and does not get bitter. Head lettuce runs to seed before the heads are fully formed. Early Wakefield cabbage does well, but no other kind that we have tried. The worms don't trouble carrots. Chickweed grows finely here, much to our sorrow. Mr. Rock will inclose, under cover of another envelope, samples of wheat, oats, and buckwheat. Wheat and oats grow about as high as in the States.

Very respectfully,

Mrs. S. H. Rock.

Prof. C. C. Georgeson, *Sitka, Alaska.*

[The buckwheat sent by Mr. Rock was ripe and the barley would ripen, but was pulled while in the milk. The wheat was a late variety and could not ripen in that region.—C. C. G.]

Carmel, Alaska, *July 24, 1900.*

Dear Sir: Your kind favors of October 15, 1899, and of April 24, 1900, as also the two nice, large packages of garden seeds, came to hand on June 30. We thank you heartily for the same. As the seed came so late we were obliged to use the last year's seeds from you, which were just about as good, although a year older. You ask for the names of permanent settlers who are interested in agricultural development. I inclose a list herewith.

I see among your seeds the Early Winningstadt cabbage. We much prefer the Jersey Wakefield. Having tried both kinds for several years, we do not plant the Winningstadt, provided we have the Wakefield. Of all your other kinds of seeds we can not speak too highly, as they are doing remarkably well. We take pleasure in showing callers our large vegetable garden and flower beds. It makes us forget we are up in southwest Alaska. The captains of revenue cutters and cannery steamers all are more than pleased and surprised at our vegetables.

When I came here eleven years ago I set to work in good earnest to start a garden, using mostly only spare and odd time. Then I never dreamed or thought that after some years we would raise over 100 bushels of potatoes, as we did last year, 70 weighing over 90 pounds. Besides having an ample supply for the mission we sold potatoes to the amount of $70. They were sold at 3 cents a pound. Of lettuce, radishes, cabbage, and turnips we generally give away a good portion, as many friends around show us many kindnesses and courtesies. Peas do all right. Carrots are a little slow. Cauliflower and kale do remarkably well. They weighed as much as 8 pounds apiece last summer. This year we tried wheat, barley, and buckwheat. The latter is in bloom, while barley shows splendid heads at this writing.

I regret I will not be able to write later, as our last mail generally leaves in August when I expect to be away on a census trip. I much regret that a copy of your report failed to come, which you mentioned was sent.

Now a word about cattle. The only stock kept at the mission at present are pigs and chickens. Neither have done their best as yet for at least two reasons. First, the want of a good barn and sufficient food; second, being penned up in a comparatively small place on account of the wolfish dogs, which are indispensable for our winter traveling. And yet our results have been good. We are well satisfied as to the beginning. Six little pigs were born in January and are all doing well and growing nicely. Our chickens commenced laying early and are thriving. For the last two years we have tried to secure at least one cow, but circumstances have prevented it thus far. There is no doubt, however, in my mind but that cattle could be made to pay well. But all three products must be utilized, namely, meat, milk, and dung—the latter for gardening purposes, as the land in this vicinity is not as rich as it is claimed to be. Meat would easily bring 15 cents a pound.

If one desires to go into farming on a small scale and live near a village or settlement, stock, such as cows, pigs, and chickens, could easily secure their food for at least six months in the year, and in favorable seasons for seven months. The abundance of roots, herbs, berries, and grass in this region will sustain any amount of stock. The country, while of a rolling prairie nature, is covered with moss, berries, brush, and timber. In lowlands or ravines a splendid growth of grass can be found, so that a large amount of hay could be secured.

I also believe, from what I know about farming (having been raised on a farm), that oats and barley could be raised, so that an ample supply of grain for food in winter could be secured. But, since money is being made by a quicker process in this vicinity, namely, by the enormous lot of fish, from a million to a million and a half dollars going out of the river each season, fishermen making from $1 to $20 per day, and over $400 besides board and all expenses during the summer, it is doubtful whether agriculture will be much looked after in the near future. It is impossible for the mission at present to go into agriculture to a large extent, although year by year we are improving and extending our gardens.

For this year we had sent for a 12-inch plow, but received instead a cultivator and a small garden plow.

Trusting that my lines may be of some encouragement to others, I remain,

Very repectfully,

J. H. SCHOECHERT.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

REPORTS FROM HOLY CROSS MISSION.

HOLY CROSS MISSION,
Koserefsky P. O., Yukon River, Alaska, October 1, 1899.

DEAR SIR: It is with great pleasure that I forward the following account of our experiments this season. I trust you will excuse its meagerness of detail, as I have been absent a great part of the summer and could not follow up personally our agricultural endeavors as I should like to have done. Moreover, all the old workmen and school boys were away catching and curing salmon. Add to this the unfavorable weather, first a short hot drought, and then until now a long and cold deluge. This year Alaska surpassed herself for rain. An early spring is what we had this summer. So quickly and suddenly did the snow and killing frost come that it was a question whether we could get the crops safely housed. But by the 23d of September all was secure. The Yukon ice is expected inside of a week and already there is skating on the lakes.

The result of the garden of the boys' school was:

1. *Potatoes.*—Early Rose, 1 acre. Seed, small potatoes planted whole. Yield 200 bushels, medium or large, according to soil; largest 17 ounces.

2. *Turnips.*—Early Flat Dutch, good ground, excellent; largest 8½ pounds, circumference 39 inches. Munich Purple, good ground, excellent; largest 7 pounds, circumference 30 inches.

3. *Ruta-bagas.*—Long Imperial. Crop fair.

4. *Beets.*—Bastian Extra Early, rich soil, rather poor; largest three-fourths pound.

5. *Carrots.*—Early Scarlet Horn, rich soil, good; largest three-fourths pound. Early French Horn, rich soil, good; largest three-fourths pound. Ox Heart, rich soil, good; largest three-fourths pound.

6. *Onion.*—Large Red Wethersfield, new ground, small. Will do for sets next year.

7. *Radishes.*—Early Scarlet Top, rich ground; record breakers, juicy. French Breakfast, rich ground, excellent.

8. *Cabbage.*—Early Hanson, rich ground, good. Suffered from early drought.

9. Cauliflower.—Earliest Erfurt, good soil, excellent; 2 feet 9 inches circumference. Early Paris, same as above.

10. Lettuce, Endive, Rosemary.—All did very well.

I should mention that the gardens were cleared of snow eight or ten days sooner than usual by the use of wood ashes or earth scattered thinly over the surface of the snow in the beginning of May.

In the fall of 1898 we planted healthy plants of domestic strawberries and rhubarb, raised here from seed. The rhubarb all survived and flourished; of the strawberries only about one-half, or less, lived through the winter. Wheat sown last fall was completely winter-killed; our seed was too old, I believe. Native berries were not abundant this year; it was too rainy. The Indians gather bushels of berries every fall for winter use. The raspberry is very prolific. I believe our native berries and hardy fruits could be improved by proper care. We are very anxious to try the cultivated blackberry, but I fear that the plants will not arrive in good condition from the States. Perhaps seeds would be better; that is, if the mail would deliver them in time.

Timothy grows luxuriantly here, but we have not broken ground for it for lack of horses and machinery. Winter hay, gathered on the frozen lakes, is cut when the ice is solid and is easy to harvest. The scythe glides over the ice so easily, and the grass remains green long into the winter. Cattle are very fond of it. They can feed on it until Christmas, about which time the snow covers it completely. I do not believe, however, that it can be very nutritious. Our cattle at present consist of one bull, two cows, one heifer, and one bull calf, all native born except one.

Not having any horses we are thinking of trying our dogs for light plowing. It has been done up the river, and we shall in our next report give you a description of this rather unique method of plowing. For breaking new ground we have heretofore used the mattock, but it is a slow and laborious proceeding. Our gardens, which have the reputation of being the finest in the Yukon Valley, cover less than 4 acres, including those of the Sisters. They have been wrested from the woods, brush, and moss by hard toil. Now that we see that gardening can be made a success, we have hopes of causing the natives to take it up. With their cellars full of potatoes they need not fear the periodical fish famines, not to speak of the benefit to their health an addition of vegetables to their diet would produce. Our boys and girls are quite proficient now in the art of gardening, some of them having gardens independent of ours.

Passers-by have been much surprised to see us excavating cellars without meeting frozen ground, as seems to be the case everywhere else, especially where the ground is covered with moss. A well dug in our yard 25 feet deep was entirely free from frost to the bottom. The reason of it is very likely this, that the ground here has been cleared for ten years, which allows the summer heat to gain some every year on the frost beneath. Graves in the woods near by have been cut 6 feet through soft earth without any sign of frost.

This year the field mice have done considerable harm. From one nest the boys took about one-half bushel of small potatoes; and now they invade the storehouses also, doing much mischief. Grouse, geese, and ducks are plentiful just now, and so are muskrats and other small quadrupeds. Deer were exceedingly scarce last winter, as also were salmon this summer.

Yours, very truly,

RAPHAEL J. CRIMONT,
Superintendent Holy Cross Mission.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

REPORT FROM THE SISTERS OF THE HOLY CROSS FOR 1899.

The following extracts are made:

Not a drop of rain fell since the snow disappeared until the 7th of July. Then we had long spells of cold rainy weather with very few bright warm days between. Nevertheless, our crops are very satisfactory. Besides the amount of vegetables our large community consumed during the summer, and the many presents given to our friends, we have 250 bushels of potatoes, 500 heads of cabbage, 80 bushels of turnips, and a few bushels of carrots. We planted 57 different varieties of flowers, but only 40 had time to bloom before the frost came. The rhubarb did very well, but the strawberries have been entirely neglected, as no one here is acquainted with the proper way of treating them.

Our cabbage (the Early Jersey Wakefield) and cauliflowers (the Early Erfurt and Early Paris) were just splendid this year. We had over 1,400 plants and nearly all produced good solid heads. I am sorry to say that we had not a single package of seed from your Department this spring. But we are thankful for those you sent this summer. They shall have a fair trial next year.

The Sisters of St. Ann at Holy Cross Mission maintain a separate institution for native girls and they also have their own gardens, which are more particularly under the special care of one of their number. They raise all the vegetables required by the school and their products have the reputation of being the finest that skill and patience can produce. They are equally successful with flowers. All the leading hardy annuals may be found in their garden every summer. All this, of course, means careful work and some hard work and constant unrelenting vigilance. As in the boys' school, the girls likewise help in the garden and thus learn the art from experience. As an example of the infinite trouble they take with their gardens it may be mentioned that they gather large quantities of leaf mold from the woods every fall. This is kept in readiness for use in early spring. From the river they carry home sand to mix with the leaf mold. Last spring it was noticed that this leaf mold was full of the larvæ of beetles and other insects destructive to plants. From experience it was known that it would be worse than useless to plant seeds in this mold, and yet the mold was needed. The problem therefore was to kill the larvæ and the eggs it contained. It was solved by heating it in pans in the stove and in the oven, a stupendous task—there were 18 barrels of it—but it was done. No worms lived to destroy the seedling cabbages, cauliflower, radishes, and other things. I mention this to show the infinite pains which sometimes is the price of success when gardening under difficulties.

This prepared earth is put in boxes, 33 by 22 inches and 9½ inches deep, and seeds of plants which are to be transplated sown therein about the middle of April. When seeded they are carried to a sunny, sheltered spot out of doors and covered with double windows. Toward evening, when the sun sinks low, they are wrapped in parkies, old comforters, blankets, and the like, to protect them from night frost. The seeding is made so that there will be about 300 to 320 plants of cabbage, cauliflower, etc., to each box. Last spring they made their first seeding of radishes and onions in the open ground May 4. They planted potatoes May 15 and transplanted cabbage May 18. When setting out plants they drop a little rich earth in the hole with each plant.

It is this vigilant, painstaking care, which knows no failure, that has made the gardens at Holy Cross famous on the Yukon. It enables the good people of the mission to have an abundance of crisp, palatable vegetables to give to passing prospectors, who probably for months have had nothing better in that line than evaporated potatoes and onions, and also to share with officers and travelers on passing steamboats. (Pl. X, figs. 1 and 2.)

INVESTIGATIONS IN THE INTERIOR.

Itinerary and Notes on the Trip.

The original plan for my investigations in the interior of Alaska was to go up the Yukon via St. Michael. But the appropriation for this work not being made until May 25, and a further delay of three weeks being occasioned by the time required for the transmission of the mail in the completion of my appointment as special disbursing agent of the Treasury Department (which was done in order to facilitate the work), by the time all was in readiness the season was so far advanced that it became imperative to take the more rapid overland route.

I left Seattle June 19, accompanied by Mr. Isaac Jones, of California, who was to remain in charge of the work in the interior. We were provided with a camp outfit and provisions for two months, together with a supply of both garden and field seeds, instruments, and some tools. The seeds were intended for use in the experiments it was planned to begin and for distribution among settlers with a view to interesting them in this line of work.

We reached Skagway June 25, too late in the day to get our freight passed by the Canadian customs officials in time for shipment by train the following morning and were therefore obliged to lay over until June 27.

TRANSPORTATION.

At this point I desire to acknowledge courtesies extended to me by the transportation companies with whom I came in contact. I am also indebted to the honorable the Secretary of the Treasury for permission to travel on the revenue cutters in Alaskan waters, and on the stern-wheeler *Nunivak* on the Yukon River. The companies above referred to are the Flyer Line, Limited, of Seattle, whose boats run between White Horse and Dawson; the White Pass and Yukon Railroad; the Seattle-Yukon Transportation Company, whose boats run between Dawson and St. Michael; the North American Transportation and Trading Company, who not only gave passes for myself and assistant, but also for one-half ton of seed and supplies between Dawson and St. Michael; and the Alaska Exploration Company, for transportation for myself and assistant between Dawson and St. Michael,

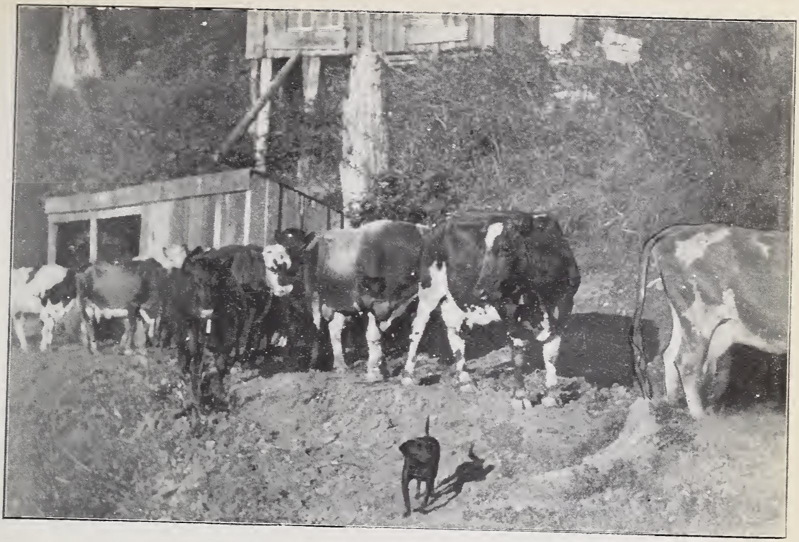


Fig. 1.—Dairy Herd at Juneau.

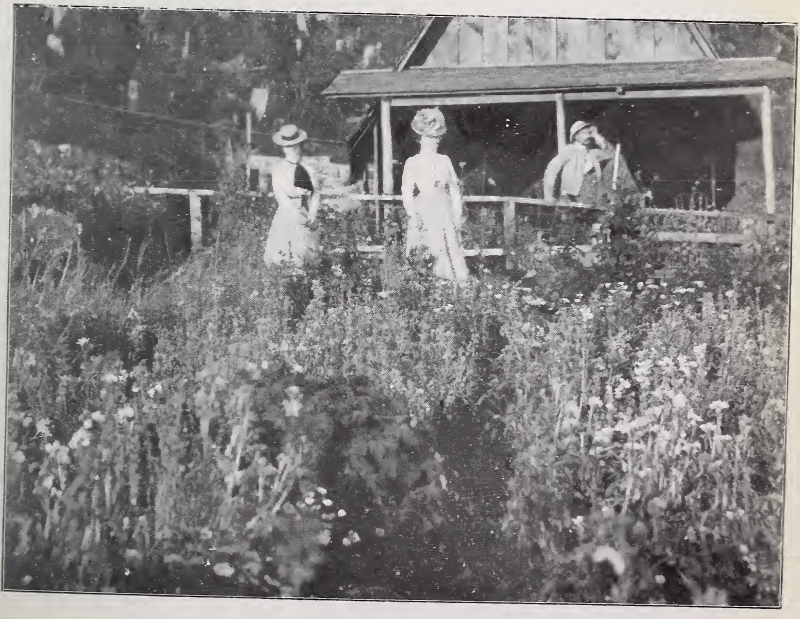


Fig. 2.—Flower Garden at Juneau.

and other courtesies. The gentlemen who represented these companies all expressed their satisfaction with the plan of establishing agricultural experiment stations in the interior because it would aid in developing the country. Had it not been for these courtesies the transportation expenses would have consumed a larger amount of the appropriation.

CANADIAN CUSTOMS PERMIT.

I must also mention that, at my request, the Honorable John McDougald, commissioner of customs, Ottawa, Canada, courteously sent me the following permit, which I found exceedingly convenient to have:

Customs Department, Canada,
Ottawa, June 13, 1900.

To Canadian Customs Officers,
Yukon Frontier:

The bearer, C. C. Georgeson, special agent in charge of Alaska investigations for the United States Department of Agriculture, with party of one or two men, may be allowed to pass back and forth across the boundary line, with their guns, instruments, and general outfit, without customs charges during the year of 1900.

John McDougald,
Commissioner of Customs.

From Skagway to White Horse.

We left Skagway June 27 on the morning train and reached the Canadian boundary at the summit of the coast range about two hours later. The road leads by a somewhat tortuous ascent over steep grades along the rugged sides of the mountains to the summit, where the international boundary line is denoted by two flags, the American and the British, planted only a few yards apart. Here the elevation is 2,885 feet, the highest point along the entire route of the Yukon, between Skagway and St. Michael. Customs officials again examined passengers' hand baggage here.

There is no agricultural land on the American side along this route except a few hundred acres in the Skagway Valley, near the town. But on the north slope of the mountains, especially between the station known as Log Cabin and Bennett, there is a tract of land much of which can be brought under culture.

At Bennett, a town which has sprung up at the south end of a lake of that name, we were again delayed a day to get our freight passed by the customs officials. The railroad had not been completed around the lake at that date. Passengers and freight were transferred to a lake boat at this point and carried to a station called Caribou, at the north end of the lake, 27 miles from Bennett, where the railroad again takes them up. The track along the lake shore has since been laid and trains now run from Skagway to White Horse without interruption. We left Bennett at 2 o'clock in the afternoon of June 28 and arrived at White Horse the same evening. Bennett has an industry peculiar to itself which has, up to the present, been quite profitable. It consists in the building of scows and occasionally more pretentious craft for the conveyance of freight to Dawson.

Most of the early prospectors built their scows here, but the mountains bordering the lake soon became denuded of their timber and, as scows were still in demand, they had to be built of lumber brought in from Puget Sound. According to the statement of the builders, lumber costs now, laid down at Bennett, $70 per thousand feet. A 20-ton scow would require from 3,000 to 3,500 feet for its construction, and it sold the past season at $400. It is merely a large trough made water-tight. In the palmy days of the early rush to the Klondike, a similar scow sold for from $1,200 to $1,500. But even at this figure it might be considered a good investment. The freight rate from Skagway to Dawson is something like $150 a ton. As Dawson was the destination of nearly all the scows which started down the river, there would naturally be a surplus of this class of water craft at this point, and I found that scows which sold for $400 at Bennett could be bought in Dawson for from $20 to $35, according to the kind of lumber employed in their construction.

The railroad traverses a stretch of country between Caribou and White Horse which contains much fine agricultural land. Some of it is wooded and other portions are covered only with bushes, with now and then an opening which yields a rich supply of rank grass now going to waste. I may remark here that after leaving the summit, where there was still some snow in the gulches, I saw no snow or glaciers on the entire trip. There is no snow in the Yukon Valley in summer, from one end to the other, not even on the mountains. The notion that snow and glaciers confront one on every hand in Alaska is erroneous.

White Horse is at present the terminus of the railroad. It is located some 2 miles below Miles Canyon, the most dangerous portion of the river. It was to save the traffic from this canyon and the treacherous rapids just below it that the railroad was built. Here the river steamers stop and take on passengers and freight carried down by the railroad. From this on there is but one mode of overland travel in summer, and that is to walk. In winter, when trails are broken, dog teams and sleds are the usual means of conveyance.

White Horse at the time of my visit consisted of a collection of log cabins and tents, though some better buildings were in progress of construction, and a large town site was laid out. It was designated as a "red-hot town," which means that saloons, gambling houses, and dance houses were doing a large business. Aside from these, bunk houses and restaurants, with about three general stores, were the only business places. Klondike prices were in force here for everything. We had to pay a dollar each for the privilege of sleeping on a piece of canvas stretched between two poles and without bedding. These bunks were built three stories high and there were about 30 in the same room, nearly all of which were occupied.

We were delayed here two days before we could get our freight aboard a boat. We should not have gotten off then had it not been for the assistance of Mr. T. M. Irwin, traffic manager of the railroad, who directed the agent to load our goods on an outgoing boat. Apparently the freight came in much faster than the boats could take it away, as 1,600 tons of freight were piled up on the bank of the river awaiting shipment to Dawson. Along the river at this point there is a fine stretch of valley land which can be utilized for agriculture and there are rich copper mines just opened up a few miles from White Horse.

From White Horse to Dawson.

We finally left White Horse on the steamer *Zealandian* June 30. The same evening our boat stuck fast in the mud at the entrance of Lake Labarge. The rapid current in the river carries down much sediment, which is dropped when the current slackens on entering the wide expanse of the lake. In consequence of this an extensive mud flat is formed on which large boats frequently get stuck when the water is low—that is, 3½ feet or less. There are channels of deeper water, but they are so shifting with the varying force of the current that even the best pilots are apt to miss them. Sand bars often form with such rapidity that in an hour or so the mud may build up about a boat which lies still and it becomes utterly helpless.

After a delay of eighteen hours, during which time every available expedient was tried to get her off, she got clear by removing part of her freight to a smaller boat. Thus lightened, she got into deeper water, where the freight was again taken aboard. From the upper end of Lake Labarge to the mouth of Big Salmon River is a stretch of 30 miles, known as "Thirty Mile," in which the current is very swift and navigation difficult. Here also the water is clear, the sediment having been deposited in the lakes which form part of the upper river course. Below the Big Salmon and thence to the mouth the Yukon resembles liquid mud. The river takes a northwesterly course to the mouth of White River, a little north of latitude 63°; then it turns north till Dawson is reached, a little north of latitude 64°. No high mountains are in sight from the river at any point.

The country south and east of Dawson is a succession of hill and dale, much of which can be farmed and nearly all of which will afford fair pasturage for cattle and sheep. Frequently steep bluffs flank the river, and again there are extensive stretches of rich bottom lands. These latter, however, are usually heavily timbered. At Fort Selkirk, about 50 miles below Five Finger Rapids, is a rather extensive tract of level country. It has the appearance of being excellent farming land. As a matter of fact, an American citizen, Mr. Frank Bach, of Douglas Island, has obtained a franchise from the Dominion Government to improve a farm there, and it is reported that he was very successful in his farming operations the past season.

We reached Dawson on the morning of July 3. The big gold camp is built on a flat along the river, and the hillside a quarter of a mile back of it has also a liberal sprinkling of log cabins and small houses. The principal streets in which the business is done run parallel with the river. In these the log cabins for the most part have given place to frame buildings, though there are several large and substantial structures built of logs. The water front is simply littered with scows and small boats which have come down with freight and prospectors, and, hidden away among this swarm of scows, were some three or four short docks at which the steamers land.

There seemed to be a large number of people in town. The hotels were full and it was hard to get accommodations at any price. The approaching celebration of the Fourth of July had attracted miners and prospectors from the creeks for miles around, and later in the day the town, especially a portion of the street fronting the river, was crowded with a hustling mass of humanity in which the gentler sex was represented by about one in twenty.

Our first effort was to learn when a steamer would go down the river, so we could reach American territory and begin work. The short summer was rapidly passing and all our work still before us. To this end we made inquiries of all the companies which had steamers on the river, but nothing definite could be learned. No boats had yet come up from St. Michael. The water had been low in the lower river and nobody could say when a boat would come. Several might come at any time and it might be a week or more. Yukon River boats do not run on schedule time. Under the circumstances, I decided to wait a day or two and watch for an opportunity to get down.

The crowded condition of the town made it difficult to find lodging anywhere. But Mr. L. R. Fulda, manager of the Alaska Exploration Company, invited us to become the guests of his company at their mess house during our enforced stay, and as the hotels turned guests away, we accepted.

A large majority of the people in Dawson are American citizens and all the leading business houses are owned by Americans. It was, therefore, no great surprise to find that the Fourth of July was celebrated with as much enthusiasm there as in an American city. But it was somewhat of a surprise to see the Canadian mounted police march in the procession in honor of the day. The celebration was exceedingly creditable to the American contingent in Dawson. A committee had arranged a programme which was well carried out. All

American business houses were closed the entire day and many of them were handsomely decorated. The Stars and Stripes were much in evidence everywhere. Thousands of well-dressed and well-behaved men crowded the sidewalks. A long procession of floats symbolic of the day or representative of business enterprises traversed the principal streets. Later in the day races and field sports completed the programme. I saw but little drunkenness and no rowdyism. It was a good-natured and even courteous crowd, which had come together to show their respect for the day and do honor to the country of which they were citizens.

There are several successful market gardens at Dawson and all the common, hardy vegetables are grown without trouble. Fine samples of barley and oats, grown at Dawson in 1899, were on exhibition in the rooms of the Chamber of Commerce.

Dawson to Eagle.

The uncertainty as to when a boat would arrive from St. Michael and start again on the down trip led me to start down in a scow. Accordingly, I bought a scow for $25, into which we loaded our outfit. I also hired a general helper for the entire trip, Mr. J. B. Brown, an ex-sea captain; and at the last moment a prospector, who wanted to get down to the Tanana region, offered to help manage the scow for his passage. Being shorthanded, I accepted his offer. Thus equipped, we set her adrift toward evening, July 5. The captain of a scow is not without responsibilities. He must have a sharp lookout for rocks, shoals, and eddies ahead, and the unwieldiness of the craft sometimes makes it difficult to avoid them. The "sweep," or long oar in the stern, is the only means for managing it, and in a strong current it does not avail much. A scow is an independent sort of craft. It turns aside for nothing, but stubbornly demands the right of way. Except in bad rapids, of which there were none in the part of the river we passed, there is no danger of being wrecked, but there is danger of drifting onto sand bars or of being swept into eddies and swirling round and round with the water without being able to get out again. We had a brief unpleasant experience of the latter kind. Again, we sometimes found it hard to keep in the main current. More than once we were carried into sluggish and tortuous side channels between islands which it took much time and hard work to get through.

We camped the first night some miles from Dawson, but started again at 2 o'clock in the morning and arrived at Eagle, the first town in American territory and about 100 miles from Dawson, at 10 o'clock the same evening. Along this stretch the river is flanked with high bluffs in many places. Back from the river the country is rolling, the valleys and level ground being almost invariably more or less heavily timbered with spruce, fir, and balsam poplar, while the hills are covered with grass and low bushes. At Forty Mile, a small settlement at the mouth of the creek of that name, there is a considerable tract of level land which appeared to be suitable for farming. Cudahy is a trading post on the north side of the mouth of Forty Mile Creek, at which the North American Transportation and Trading Company has large warehouses.

EAGLE AND NEIGHBORHOOD.

We arrived at Eagle late Friday evening, July 6. This town is in about latitude 64° 45′ N. It is beautifully situated on high ground on the west bank, near a bend of the river. Perhaps it can be said to have the most beautiful town site of any town on the Yukon. The valley broadens out at this point and southward to the boundary line so as to be many square miles in extent, nearly all of which could be made fine farming land. The town has perhaps 200 cabins, most of which were, however, empty at the time of my visit, because the owners were out prospecting. Four large trading companies are represented, namely, the Seattle-Yukon Transportation Company, the North American Transportation and Trading Company, the Alaska Exploration Company, and the Alaska Commercial Company, all of which maintain well-stocked stores.

Fort Egbert is located here; it has a garrison of about 200 soldiers. The fort has now many buildings—barracks, stables, hospital, officers' houses, etc., all of which were built by the officers and men stationed at the fort, in the course of a few months. There are two sawmills at the place, one belonging to the fort and the other to private parties.

An efficient mission has been organized by the Rev. Mr. Kirk, of the Presbyterian Church, who also maintains a free reading room at his house. The Roman Catholics also have a mission there under the charge of Father Monroe. The headquarters of the United States Weather Service for the interior of Alaska is also located here, in charge of Mr. U. G. Myers as section director, to whom I am under obligations for assistance at the time of my visit and for collecting and forwarding samples of grain.

There were several promising gardens, though at that date it was too early to tell what the outcome would be. Mr. O. H. Walters had a fine potato patch; Father Monroe had a promising garden which contained nearly all the hardy vegetables; but the largest garden was at the fort. Here were potatoes, carrots, peas, wax beans, lettuce, radishes, cabbage, and cauliflower, all doing well. There were also small patches of barley and oats well headed out at that date. A settler in the valley on the other side of the river had a small field of oats; also some barley, doing well. Of these I have since received ripe samples.

NATURAL MEADOWS.

Here, as elsewhere in the interior, grass grows luxuriantly wherever the moss is destroyed so it can get a foothold. I was informed by men who had traveled much over the country in that region that there were many large natural meadows which produced large crops of grass. One, especially, on the Mosquito Fork of the Forty Mile contained many hundreds of acres. These meadows are in places so level and smooth that a mowing machine can be used to cut the grass. I heard of similar meadows in many places in the interior.

As stated, there is a large area of agricultural land in the Yukon Valley at Eagle, chiefly south of town toward the boundary; but there is also quite a tract on the opposite side of the river. The land is rich, as is indicated by the luxuriant growth of grass whenever the moss has been burned off. The timber grows to considerable size here, but much of it has already been removed and used for buildings, saw logs, and fuel.

I was requested by many of the citizens to locate an experiment station at that point, but I did not feel justified in selecting a site there for the reason that it lies almost on the boundary of the Territory and would, therefore, not be representative of the interior of Alaska to the extent that a station nearer the center would be. With the small appropriation at our disposal I did not deem it wise to start work there. Moreover, the region is somewhat isolated. After leaving Eagle the river runs through a mountainous district for many miles, where there is but little farming land. I did, however, distribute seed to all who wanted it, and one of the settlers agreed to grow a small area of the leading kinds of grain next year as an experiment, for which I supplied him with seed.

WINTER FEED FOR LIVE STOCK.

Perhaps an indication of the agricultural possibilities of the country may be found in the fact that live stock can find enough feed to sustain life out doors even in winter. I was informed by the commanding officer of the fort that their hay gave out about the middle of the preceding winter and the grain feed ran very short. On January 15, 19 head of horses and mules were turned out to shift for themselves, and from that time on they got only 2 pounds of grain a day per head. They found enough in the woods to complement this small feed of grain, and went through four months of cold weather without material loss of flesh.

GOLD-BEARING CREEKS.

Mission Creek, which enters the Yukon at Eagle, is said to contain placer gold in paying quantities, and the same is reported of American Creek, a tributary to Mission Creek, as well as of other small creeks and gulches. The branches of Forty Mile River, which likewise have placer-gold diggings, are distant some 75 miles, and Eagle is to some extent the supply depot for these creeks. Should the district prove to be as rich as is anticipated, Eagle will have a comparatively large population for years to come.

CIRCLE.

The scow left Eagle for Circle Sunday morning, July 8, with our outfit and Messrs. Jones, Brown, and Burns on board. I decided to study the conditions at Eagle for another day, so I remained until early in the morning of July 10, when the *Rock Island*, a steamer belonging to the Seattle-Yukon Transportation Company, came down from Dawson. I took passage on her, and reached Circle late the same evening. For a distance of some 50 or 60 miles from Eagle the country is comparatively rough. The river valley is narrow in most places, and there is not much farming land except where creeks enter the Yukon. As I have already remarked, the valleys are generally wooded, and the hills covered with shrubs and grass. Toward Circle the country gradually becomes smoother, and the area of land susceptible of cultivation is consequently greater.

Circle is located in about latitude 65° 35′ N. It is a collection of log cabins and a few good-sized log houses. The town had an extra large population at the time of my visit. Gold had been found on some of the branches of the Tanana, about 135 miles from Circle, and being the port of entry, so to speak, to these new diggings, prospectors had flocked there from all quarters.

The country for many miles around is almost a dead level and without timber of any kind, at least in the immediate vicinity. Much of the land is wet and is in fact largely tundra, so that the chief obstacle to successful farming and gardening is a question of drainage. But this, I believe, can be overcome. The rainfall is light and there is not much surface water to be carried off. If the moss is once removed and the soil thoroughly broken and ameliorated by exposure to the air, it would seem that farming would not only be possible but, the ground being rich, would yield large crops.

There were a few creditable gardens in the town. Judge Sherman, United States commissioner, had a patch of oats which was promising at that date, but I have not learned if it matured. I was informed by a prospector who claimed to have seen it, that the keeper of a road house some 12 miles from Circle raised 40 bushels of good ripe oats in 1899, and that he sold the grain at Circle. I did not have this statement verified by others, but there is no reason why it should not be true.

Our scow had arrived at Circle the same day I arrived. The plan was that the men should go on to Fort Yukon in her, but the prospector left us at Circle and none of us had ever been through the flats, and therefore felt diffident about piloting her through. Nor could we find a pilot who would go along for any reasonable price.

Our outfit was, therefore, put aboard the *Rock Island* and we all proceeded to Fort Yukon the same night.

THE YUKON FLATS.

From Circle to Fort Hamlin, a distance of more than 200 miles, the Yukon traverses a region of country so level that it has been called "the flats," or the "Yukon flats." This level country extends for many miles on either side of the river, but more especially to the northward. The hilly and in places mountainous country through which the river has hitherto taken its course now changes to a monotonous level which extends over an area of about 30,000 square miles. Not only are there no hills or mountains near the river, but there are none in sight in any direction, except on very clear days when the Tanana Mountains can be seen to the southward on the distant horizon and a single high peak to the northwestward.

The region was probably once a vast lake. It is now covered with a dense growth of spruce and other hardy conifers. So far as I have learned, this vast region has never been thoroughly explored. Besides the Yukon, it has but few water courses, and these are navigable only for canoes or small boats. We know, therefore, but little of the character of the country except as it may be seen from the river, and here it appears to be a very sandy loam, or even almost pure sand, more or less stratified. The banks were only some 8 or 10 feet high when I passed through, when the river may be said to have been at its medium level. During ice jams in the spring it rises much higher, and I saw evidences of overflow in the woods at Fort Yukon half a mile or more from the river.

The accompanying illustration (Pl. XI, figs. 1 and 2) shows views on the flats, taken while passing through on the boat. Fig. 1 shows also the nature of the vegetation. Near the river, where the bank has been built up comparatively recently, the ground is covered with young willows. The process of bank building is well shown in their gradation in size and age. Back of the willows are spruce, and these likewise increase in size and age as they are more and more removed from the river, till the normal forest is reached, sometimes hundreds of yards from the bank. The river is constantly washing down the banks in some places and building them up in others. It is a common sight to see tall spruce trees toppled over, with their heads in the river, while their roots still cling to the bank, and this sometimes for miles at a stretch, while possibly on the opposite shore there would be a bare sand bank, built up from deposits recently made, and the vegetation gradually taking possession of it, year by year, as indicated by the successive heights of the bushes and trees. Through the flats the river is peculiar, in that its real boundaries are rarely seen. It is in many places 5 or 6 miles wide, and it is so littered with islands that one can seldom see its real shores. In places there are half a dozen islands abreast, with broad stretches of water between them. Many of these islands are large, containing hundreds of acres, and one may easily mistake them for the mainland, but the majority of them are small. The current being thus divided between many channels, spreads over a broad expanse, and is much slower than where the river is more confined. The water is everywhere shallow, and navigation difficult, even though the boat does not draw more than 3 or 4 feet of water. The channel followed by the ice when it breaks up usually becomes the steamboat channel for the season.

There are no settlements between Circle and Fort Hamlin, except at Fort Yukon, and during the summer a few Indian fishing camps here and there along the stream wherever the fishing is good. During the summer there are also wood-choppers' camps at intervals through the flats, as, indeed, along the entire course of the river, but aside from these summer camps the region appears to be uninhabited. The steamers are dependent on wood for their fuel, and many thousand cords are used every summer by the river fleet. This wood is cut wherever it can be most conveniently piled on the river bank near a good landing place, and the steamers stop several times a day to wood up. They simply run up to the bank, throw a gang plank ashore, and a gang of men carry the wood aboard in their arms.

From Circle the river flows almost directly northwest to the mouth of the Porcupine, a few miles north of the arctic circle. It here makes a right-angled turn and flows southwest.

Reservation at Fort Yukon.

Fort Yukon is situated east of the mouth of the Porcupine, on the north side of this great bend of the Yukon, in about latitude 66° 35′ N., or some 3 or 4 miles north of the Arctic Circle. There was at one time a small military post located here, whence the name. It now consists of ten or twelve log cabins, mostly occupied by the Indians. The North American Transportation and Trading Company has a store and warehouse there. There is also a trading store in private hands and the Episcopal Church has established a mission there. At the time of my visit there were only some half dozen white people in the place. The accompanying illustration shows the store and mission buildings. (Pl. XII, figs. 1 and 2.)

We arrived here July 11 with a view to investigate the location as a site for an experiment station. My first plan was to locate the main station for the interior at Fort Yukon. It is representative of the conditions which prevail over a large area; it is north of the Arctic

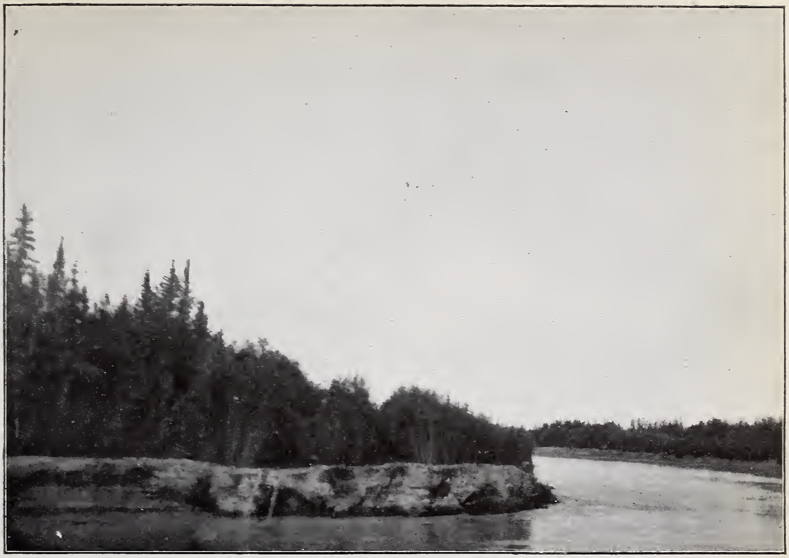


FIG. 1.—YUKON FLATS, SHOWING CHARACTER OF VEGETATION.

FIG. 2.—YUKON FLATS.

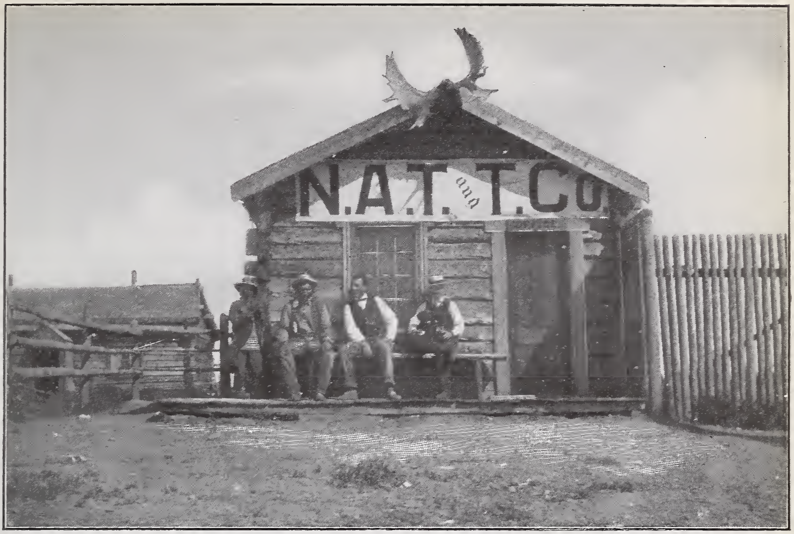


FIG. 1.—STORE AT FORT YUKON.

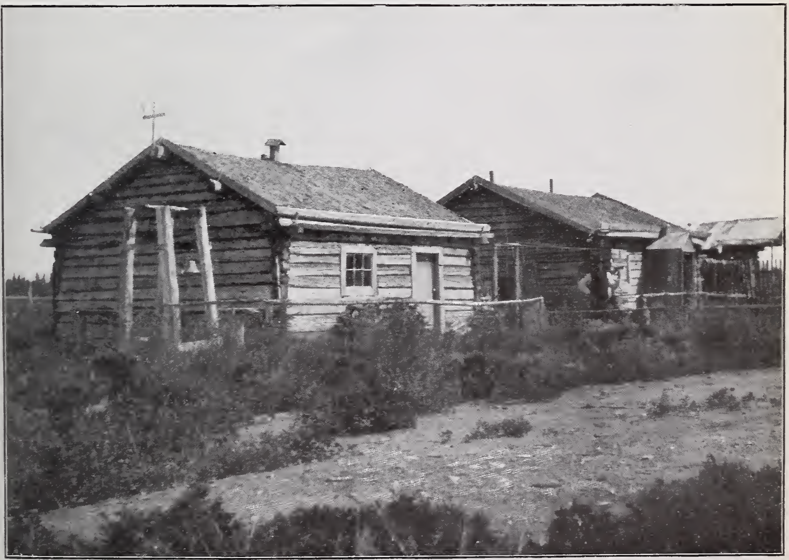


FIG. 2.—EPISCOPAL MISSION, FORT YUKON.

Circle, and whatever could be grown there it might reasonably be presumed could be grown anywhere to the southward. A closer investigation, however, caused me to change my mind. While it seems desirable that we should have a station there for the reasons named, it does not appear to be the best location for our main station in the interior. The soil consists mainly of light sand, which will probably have a tendency to drift in dry weather. The summer is dry and the vegetation is likely to suffer from drought at times. Again, the ground is a universal level, and it will be difficult to remove the soil water when the river is high. Another objection is that the place appears to have lost its importance as a trading post. This feature has recently been augmented by a natural cause: a sand bar has formed across the river so that the boats can no longer follow the bank around to Fort Yukon. It is now necessary to go some 3 or 4 miles below and there make a turn around an island and go back up to the little town. This, of course, makes it more isolated than ever because boats will not take the time to go up there except when they have business to justify it. All these things conspire to make the place of little importance. Few people would visit it or see the results of experiments. Nevertheless, its location inside of the arctic circle made it desirable make that tests should be made there.

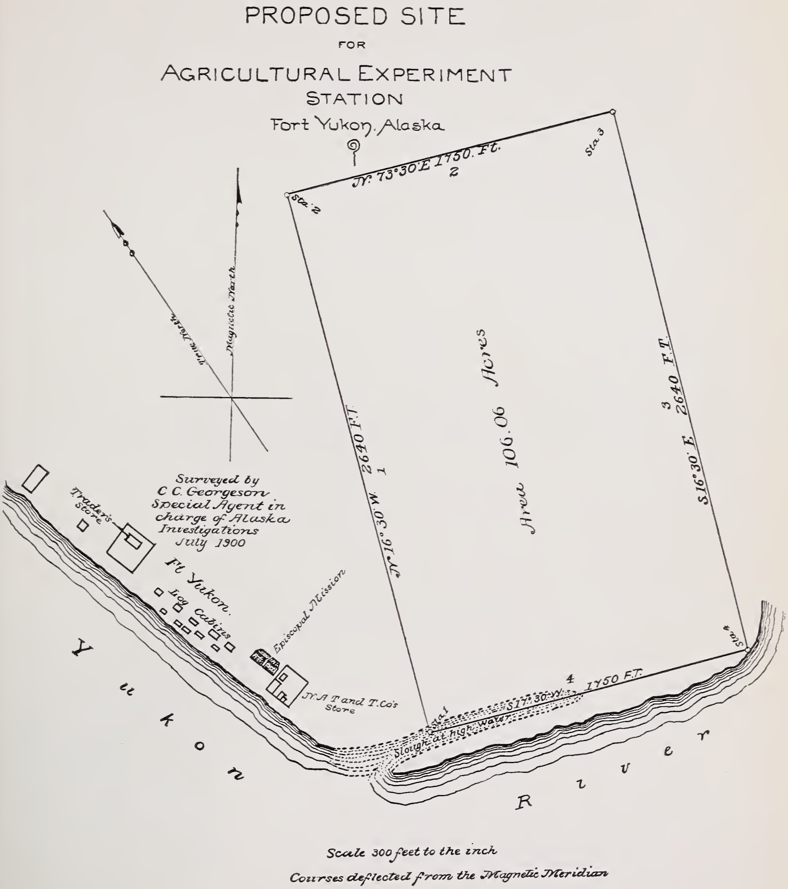
I therefore surveyed a tract of 106 acres, a plat of which is submitted herewith. (Pl. XIII.) I consider this area ample for all the work it is advisable to undertake at that point, and I recommend that it be reserved and that a substation be established there.

The prevailing vegetation about Fort Yukon, as, indeed, all over the Yukon flats, is spruce forest. The trees are not large. I saw none at this place over 10 inches in diameter, and most of them are smaller than that. But they make up in numbers what they lack in size. They grow so close together as to form an almost impenetrable thicket. Where this is the case there is little or no undergrowth except moss. Nor are the trees tall. Forty or 50 feet will be the limit in most cases. They are as straight as candles and the trunks thickly studded with short, bushy branches almost from the ground. The branches do not spread out even when the trees are isolated and have plenty of room. A tree 50 feet high will have a top only 4 or 5 feet in diameter at its broadest point. It is this close habit of growth which makes it possible for the trees to grow so close together that in many places a person can not pass between them. This spruce forest is a splendid illustration of the law of the survival of the fittest, or rather of the strongest. The struggle for existence is intense—a struggle for light, air, and room. The weaklings are crowded, suppressed, and lost, while their stronger neighbors rear their heads triumphantly above them and rob them of nourishment below and of light and sunshine above.

Next in importance comes the birch and then the balsam poplar, but at Fort Yukon there are not many of either. Alders form thickets in wet places, and sometimes they attain the size of small trees. Willows are apparently the first arborescent occupants of newly made ground and hold it until they are driven away and crushed by the irresistible advance of the hosts of the spruce. These are the leading form of tree growth. There are many smaller bushes, but, aside from berry bushes, none of economic value. Flowering plants are not numerous. Compositæ seemed to be the leading representatives, but no form of vegetation is more abundant than moss. It covers the ground everywhere as with a thick, soft, but damp, blanket—in the spruce forests, as well as on the tundra; and this is true not only of this particular region, but of nearly all the interior. The willow thickets and places over which sediment is deposited by periodical floods are the chief exceptions. Grasses were quite abundant at Fort Yukon, and they grew luxuriantly wherever the ground was cleared and the moss destroyed. They seemed to come spontaneously in these places. Several species were represented. There is no doubt about the capacity of the soil and climate to produce plenty of forage for live stock.

I will here note a fact of much importance from an agricultural standpoint. It is that cleared ground thaws out completely every spring. This holds true over much of Alaska. As a matter of fact, the ground does not freeze deeply. The snowfall is so heavy—from 4 to 8 feet—that it becomes an effective protection to the ground; but it is true only of cleared ground and of places where the sun can reach the ground. Wherever vegetation covers the surface so as to keep the sun off the ground remains frozen the year round. In the woods at Fort Yukon we found ice immediately beneath a layer of moss 6 inches thick. The spruce tops kept the sun off the moss, and the moss preserved the ice as sawdust preserves it in an ice house. But on bare ground we found no ice at a depth of 4 feet. In this connection I beg to call attention to the statements made by Rev. R. J. Crimont in his report from Holy Cross Mission and submitted herewith. He states that "a well dug in our yard 25 feet deep was entirely free from frost to the bottom." I emphasize this point because it seems to be a very general notion that agriculture is impossible because the ground is frozen to within a few inches of the surface. This is erroneous, in so far that it holds true only where the vegetation prevents the sun from warming the soil. Pl. XIV, fig. 1, shows a distant view of the woods on the proposed site for an experiment station. The trees show their pyramidal habit of growth. Pl. XIV, fig. 2, is a photograph of a typical Indian camp at Fort Yukon.

The heat was intense. It was almost impossible to work in the sun during the middle of the day. Dr. William H. Dall remarks, in an



PLAT OF PROPOSED SITE FOR AGRICULTURAL EXPERIMENT STATION, FORT YUKON.

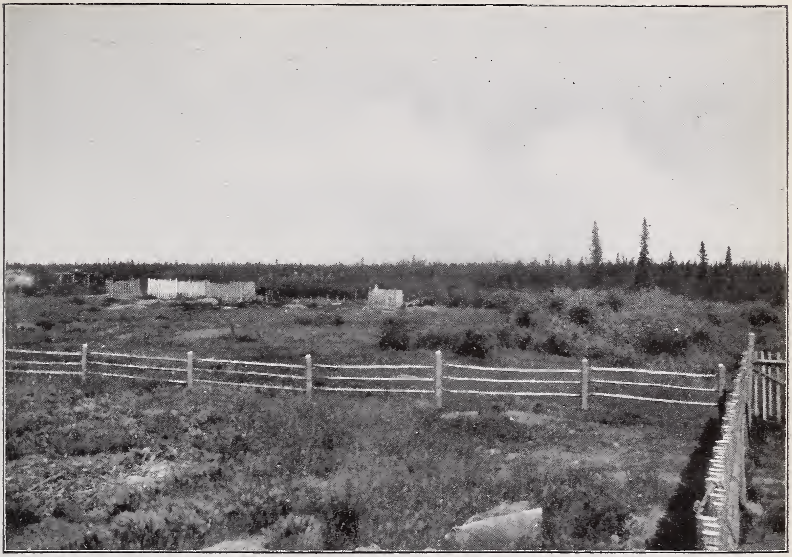


FIG. 1.—VIEW AT FORT YUKON.

Foreground, Indian cemetery; background, proposed site for United States Experiment Station.

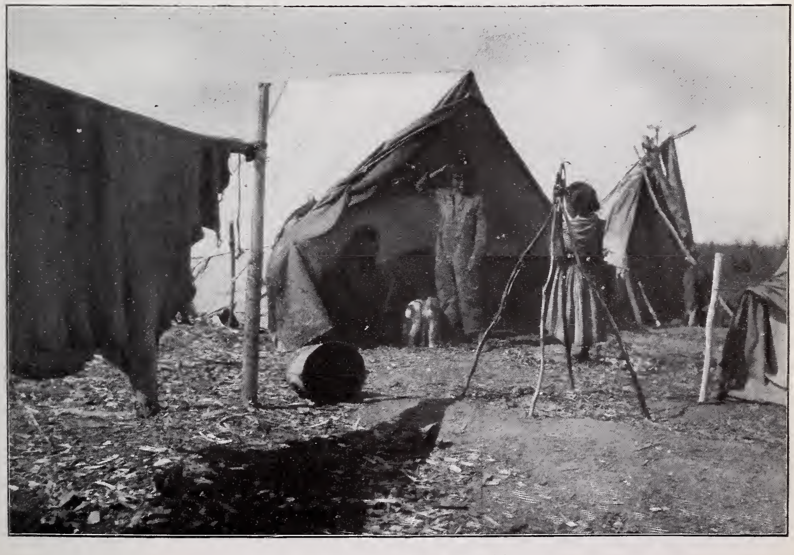


FIG. 2.—INDIAN CAMP, FORT YUKON.

article entitled "The agricultural resources of Alaska," in the report of the Commissioner of Agriculture for 1868, that the temperature at Fort Yukon rose to 112° F. "not in the direct rays of the sun," and that in the winter it fell as low as 70° below zero. The mosquitoes were an intolerable pest. We had to keep face and hands covered constantly while working in the woods.

The clearing of the ground will not be difficult. The roots all grow near the surface. Repeated examinations showed that in the woods, where the ground is frozen the year round, the roots spread out horizontally on the top of the ice, and were it not for the hold that the roots have upon one another in the matted network which they form the trees could be easily pulled over. On the outskirts of the clearing, where the sun had thawed the ground, the roots went deeper, and it would require grubbing to remove them.

I have little doubt that barley and probably oats and buckwheat, and perhaps other grain also, can be matured at Fort Yukon. Vegetation grows with exceeding rapidity during the short summer. While I was there the sun set at 11 p. m. and rose again at 1 a. m. We spaded up a small patch of clear ground with the intention of seeding it next spring, and seeds of many kinds were left in care of the North American Trading and Transportation Company's agent for this purpose.

Labor is expensive. Nobody, not even the few able-bodied Indians who are there, will work for less than $5 a day, and most of the men ask much more.

Reservation at Rampart.

A boat called at Fort Yukon on the morning of July 16, and we took passage on her for Rampart, a town located nearly 200 miles, by the course of the river, southwest from Fort Yukon, in about latitude 65° 30′. The region about this place is hilly, but it can scarcely be called mountainous. As everywhere else, spruce is the predominating form of vegetation. But here the drainage is better than on the Yukon Flats, and the trees grow much larger. Timber 12 to 18 inches in diameter is not uncommon. It is the same species of spruce, and the other forms of vegetation are also the same, as those found farther north.

Here I found a location which seemed admirably adapted for an experiment station. It lies on the opposite side of the river from the town of Rampart, on a gentle slope, with a southern exposure. I made a survey of a tract here, and recommend that it be reserved for an experiment station. It fronts for 1 mile on the Yukon River and runs back half a mile, thus containing 320 acres, exclusive of ground occupied by some Indian cabins and a wood yard.

The whole tract is covered more or less densely with spruce forest, interspersed here and there with birch and occasionally a balsam poplar. Along the river is a stretch of nearly level ground about 1,000 feet wide. Back of this the ground rises gradually to the summit of a ridge which runs the entire length of the tract parallel with the river. The ridge is about 75 to 100 feet higher than the river bank. Having a south slope, it will get the full benefit of the sun. The timber is comparatively large and not so dense as at Fort Yukon. On the lower ground is some underbrush between the spruce trees, consisting chiefly of alder, dwarf birches, high cranberry bushes, and huckleberry bushes. The ground is everywhere covered with a thick layer of moss; under this is a vegetable mold on the low ground and a clay loam on the hillside. A view of the tract as it appears from Rampart is submitted herewith (Pl. XV). I also submit the plat of the survey (Pl. XVI). A few Indian cabins are built on the bank of the river. These were cut out by offsets as indicated on the plat. I likewise cut out a site for a temporary wood yard, claimed by Messrs. Wolbridge and Hitts, two citizens of Rampart.

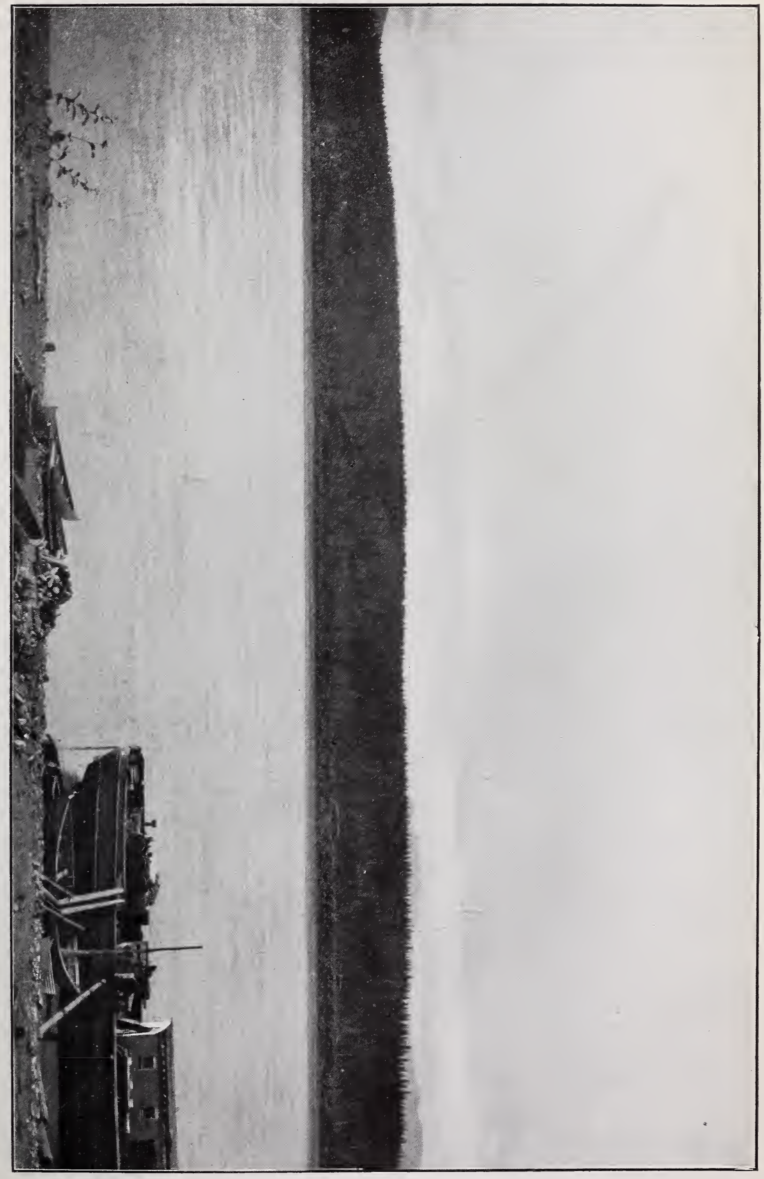
OBSERVATIONS ON WEATHER AND SOIL TEMPERATURES.

We know as yet comparatively little of the climate, except that it is cold in winter and quite warm in summer; but a voluntary weather observer has been appointed, so we shall hereafter have definite data on rainfall and temperatures. Two soil thermometers were also left there, and the assistant in charge of the work in the interior will keep a record of the soil temperatures. The early part of the summer seems to be dry. We found the moss on the hillside very dry, and it burned readily. In attempting to burn a brush pile we had much difficulty in keeping the fire from spreading.

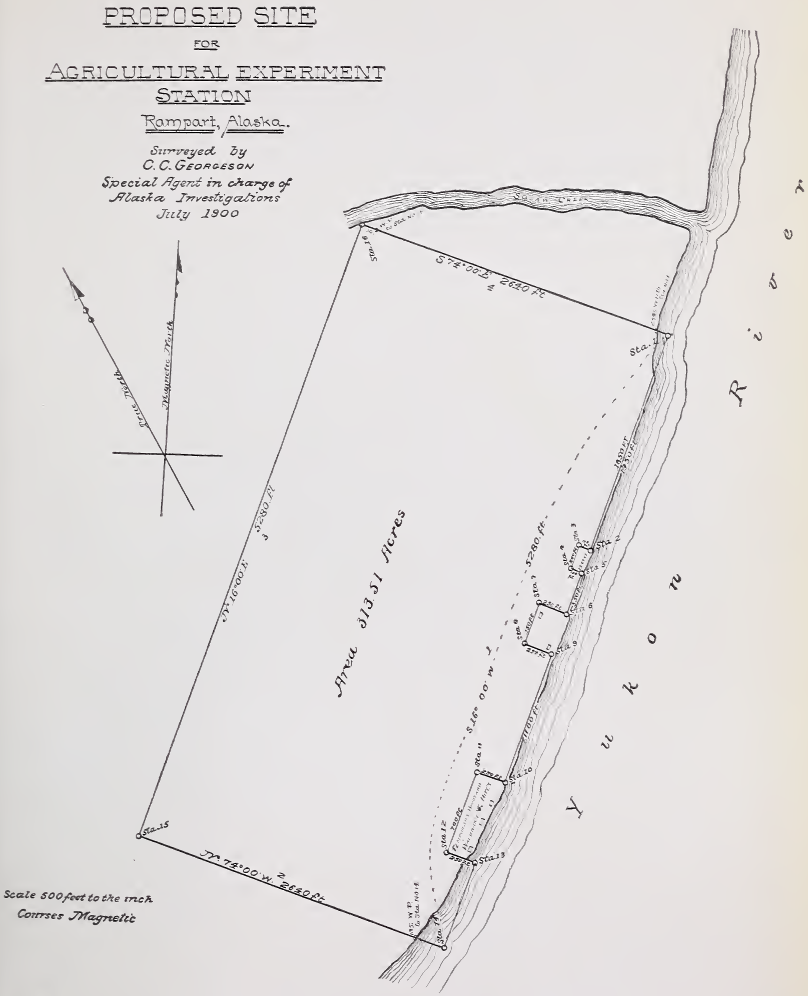
SOME EXPERIMENTS STARTED.

Mr. Isaac Jones, of California, who was appointed assistant in charge of the work at Fort Yukon and Rampart, will make the latter place his headquarters, at least for the present. He has cleared a piece of ground from which all the timber had been cut, and part of this clearing has been dug up by spade and mattock in order to have some ground in readiness for seeding next spring. He has also seeded a portion of this newly broken ground to winter grain, with a view to learning if the snow affords sufficient protection to prevent winterkilling. In this connection it is of interest to record that Mr. Jones found a few ripe heads of volunteer winter rye in a vacant lot in Rampart about the middle of September. This would indicate that fall-seeded grain can live through the winter in that latitude.

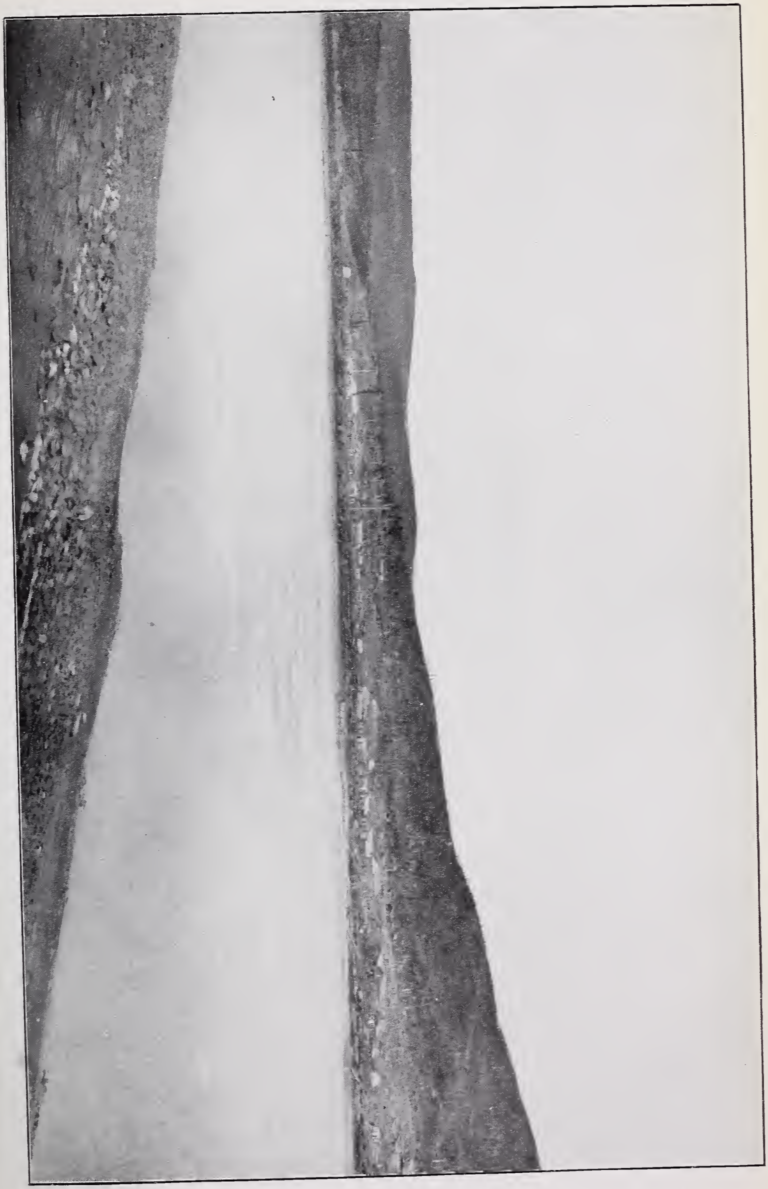
PLATE XV.



View of Proposed Site for United States Experiment Station at Rampart.



PLAT OF PROPOSED SITE FOR AGRICULTURAL EXPERIMENT STATION, RAMPART.



VIEW OF RAMPART FROM UNITED STATES EXPERIMENT STATION.

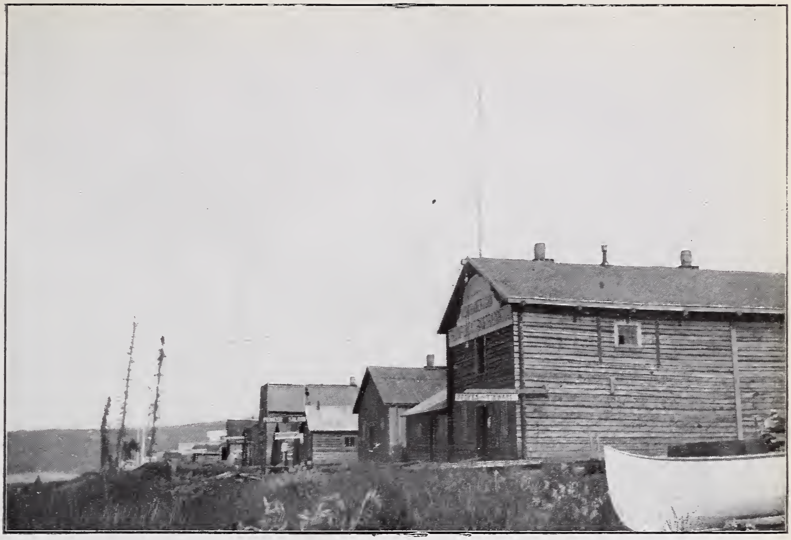


FIG. 1.—MAIN STREET, RAMPART.

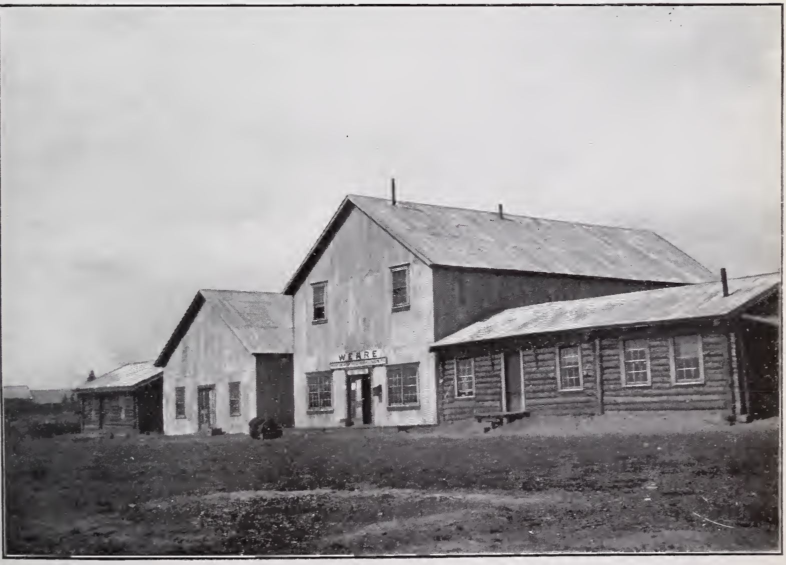


FIG. 2.—STORE AT WEARE, YUKON RIVER.

LABOR EXPENSIVE.

The price of labor varies somewhat with the location. At Eagle no one could be hired for less than $10 a day. At Fort Yukon and also at Rampart I hired a few prospectors, who were temporarily stranded there, to help clear the lines for the survey for $5 a day. But this is the minimum wage I heard of anywhere in the interior. At Rampart I was told that miners get $7.50 a day and board when working in the diggings. The funds at our disposal did not admit of hiring land cleared at these prices, and we shall therefore have available for next year's experiments only such small patches as Mr. Jones can dig up by himself. This will not afford a satisfactory test, but it is the best that we can do.

Rampart derives its importance from the placer mines found on Minook Creek and its tributaries. This creek joins the Yukon about a mile from the town. The town lies on a side hill on the south side of the Yukon. Pl. XVII is a reproduction of a photograph taken from the proposed experiment station across the river. The excitement on Minook Creek last year caused an influx of prospectors to this place, and many of them secured lots and built cabins. As a result there are several hundred cabins more than there are people, because the Nome stampede had drawn most of them away, at least temporarily. There is a United States land office at Rampart, a small military post with a detachment of 15 men, a sawmill, a mission hospital, and the four companies named as having stores at Eagle are also located there. Pl. XVIII, fig. 1, shows a view of a portion of the street along the river front.

WEARE AND NEIGHBORHOOD.

Having finished the survey at Rampart, we took boat on July 23 to Weare at the mouth of Tanana. (See Pl. XVIII, fig. 2.) This locality has recently become of importance because of the establishment of a United States military post at Weare. The post is named Fort Gibbon. Weare is the name of the North American Transportation and Trading Company's store, and the post-office, which is located in the store, is named Tanana. All three are practically at the same place. Half a mile farther up the river the Alaska Commercial Company also has a store. Aside from the post and these stores there are perhaps half a dozen cabins. This is all there is of Weare at the present time. Some 3 miles north of Weare is an Episcopal mission. It was until recently located 8 miles below Weare under the name of St. James Mission and pointed out on most of the maps of Alaska. The new mission is not yet fully established. There are a number of Indian families at the old mission, but it is understood they intend to move up the river to the new site.

The country around Weare is level for several miles back from the river and much of it is also marshy, with small lakes here and there. As elsewhere, it is completely covered with spruce forest, interspersed in places with alder, willow, balsam poplar, and, on the higher ground, some birches. The region is rolling enough to admit of being drained, and there is no doubt but that the soil will make good farming land.

I had intended to make a reservation in this region, but I found that the military reservation included an area of 10 miles square, which, together with the land owned by the trading companies and the mission, disposed of about all of the desirable land fronting on the river. Moreover, I found that this land will be somewhat more expensive to put in cultivation than is the case with the reservation at Rampart. In addition to the clearing, the peaty soil will require thorough drainage, and as it would be impossible to carry this work to a successful conclusion without the expenditure of considerable money, I made no survey there. If it is thought best to establish a station there, the site of the old St. James Mission appears to me to be the most desirable place for that purpose which can be found in the neighborhood. It is wholly inside the military reservation, however; but possibly permission could be obtained from the Secretary of War to use a few hundred acres for an agricultural experiment station, inasmuch as there is 100 square miles in the reservation. There are some fairly substantial log buildings belonging to the mission on the site. One is a nine-room two-story log house; another a plain little one-room log house, which was used for a church, and there is also a new log cabin. These buildings can probably be purchased from the mission for a reasonable price. It would be a good start toward the establishment of a station to find the buildings ready-made. The main drawback to a station at that point is to be found in the fact that the river is shallow in front of the mission, and that the only good landing place is about a mile farther down the river. Pl. XIX, fig. 1, shows two of the buildings at the old St. James Mission.

Weare is only 75 miles southwest of Rampart, and there is, therefore, no very marked difference in climate, but, on the other hand, there is much difference in soil. The station at Rampart is, as already stated, on a hillside, and may be said to represent the conditions prevailing in the hill country. At the mouth of the Tanana the surface soil is peaty, with a sandy subsoil, and is characteristic of a large area of low-lying land in the interior. It may, therefore, be deemed desirable to have a station at both places. For the present I will simply report the facts in the case without recommendations.

FORT GIBBON.

It is pertinent to add a few words here about this new military post. A large force of men, mostly soldiers, was engaged in erecting buildings for the post. Several buildings had already been erected and

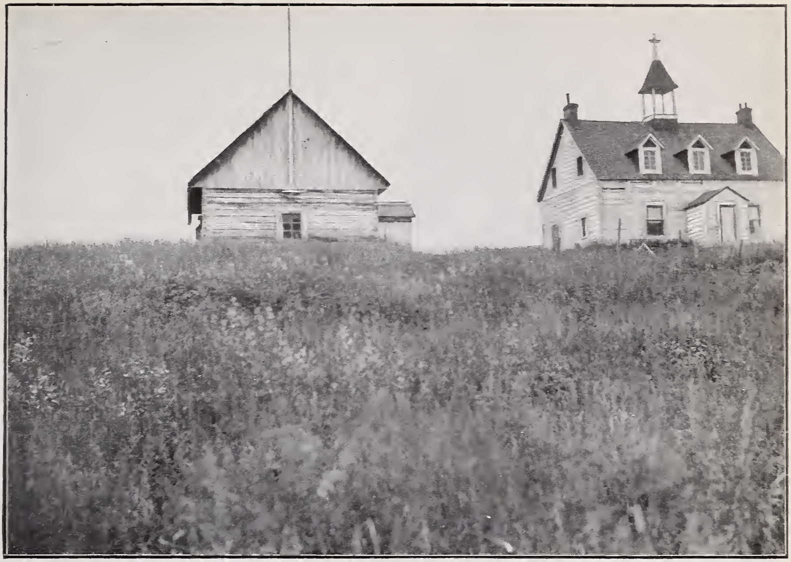


Fig. 1.—St. James Mission, near Weare.

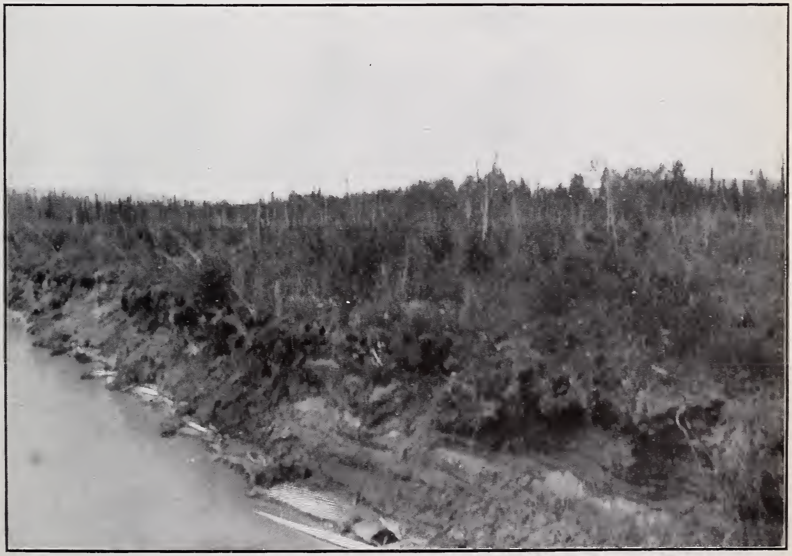


Fig. 2.—Bank of the Yukon, Showing Stratification.

others were rapidly nearing completion. There was a well-equipped sawmill, barracks for two companies, a hospital, an administration building, two or three officers' houses, stables, and storehouses. All this represented a large outlay of money and an immense amount of work. I present herewith an illustration of a general view of the post as it appeared the latter part of last July (Pl. XX), and another of the sawmill (Pl. XXI, fig. 1).

It is of interest to note the condition of the land which constitutes the large parade ground. It was frozen up to within a foot or so of the surface before it was cleared, and therefore comparatively firm; but the removal of the vegetation caused the ground ice to melt, and what was formerly solid ground now became an almost impassable bog. This seemed to be convincing evidence that thorough underdrainage will be necessary before the ground can be transformed into farming land.

There was some live stock at the fort, consisting of about 25 head of horses and mules and several cows. The horses and mules were turned out to pasture when not in use, and they certainly looked well. The cows were in splendid condition. It is certain that live stock will do well in that region in summer, and the weather is dry enough to make hay wherever natural meadows can be found.

GARDENS AT WEARE.

There were several small but good gardens at Weare and neighborhood. The Alaska Commercial Company's agent had a fine garden of the usual hardy vegetables in front of his store, and at the military post there were two very creditable gardens near the bank of the river where the drainage was good. The illustrations of these gardens are presented herewith (Pl. XXII, figs. 1 and 2). They furnished lettuce, radishes, turnips, and peas at the time I was there, and the later maturing crops, such as potatoes, cabbage, carrots, etc., all promised well. It should be borne in mind that the ground had never been cultivated before it was broken up that spring, and that new ground never produces well. That the gardens should yield good crops the first year is almost certain evidence that succeeding crops, when the ground has been thoroughly subdued, will be still better.

A Trip up the Tanana.

A little stern-wheeled steamer belonging to the fort was engaged in rafting logs down the Tanana to the sawmill. (Pl. XXI, fig. 2.) I obtained permission from the commanding officer to go along on one of her trips. I was anxious to see the Tanana country, and especially was I on the lookout for a tract of land which was not overgrown with bushes and timber, suitable for an experiment station. I had heard of several natural meadows where the grass had not been supplanted by shrubbery, but they all appeared to be subject to overflow during ice jams in the spring, and were therefore unsuited for experimental farming. I started up the Tanana July 28 and went a distance of about 100 miles to the logging camp. The river is bordered by thickly wooded, low, level land nearly all the way. Much of it is subject to overflow. In character it is a light sandy loam. In many places there was little or no moss on the ground. Low bushes, among them high-bush cranberries, red and black currants, grass and legumes, constitute the undergrowth in the woods in these places. Much of the timber was large enough to furnish respectable saw logs. Logs measuring 18 to 20 inches in diameter were not uncommon; though, on the whole, they were smaller than this. Plate XXIII shows a view of the soldiers at this logging camp engaged in building a raft. The trees were cut down wherever found within a convenient distance from the river, then cut into logs of convenient lengths, and hauled to the river bank with a team of mules. The only large timber I saw was the spruce. The deciduous trees were chiefly balsam, poplar, and birch.

Birch groves were rather numerous and the trees of good size. The birch is of great importance to the Indians of this region. All their canoes are built of birch bark, and I saw many places where the bark had been removed from the larger trees from the ground as high up as a man could conveniently reach. In localities where there are many Indians but few large living birch trees are to be found. The canoes are small and very light, ordinarily carrying one man in each. While I was at Weare a fleet of between thirty and forty birch-bark canoes, each carrying one man and occasionally also a child, came down the Tanana River to trade. Going upstream they keep close to the bank to avoid the more rapid current in deep water, and work their way with short poles; or they use the short, light paddle as a pole, sitting all the time on their knees and heels.

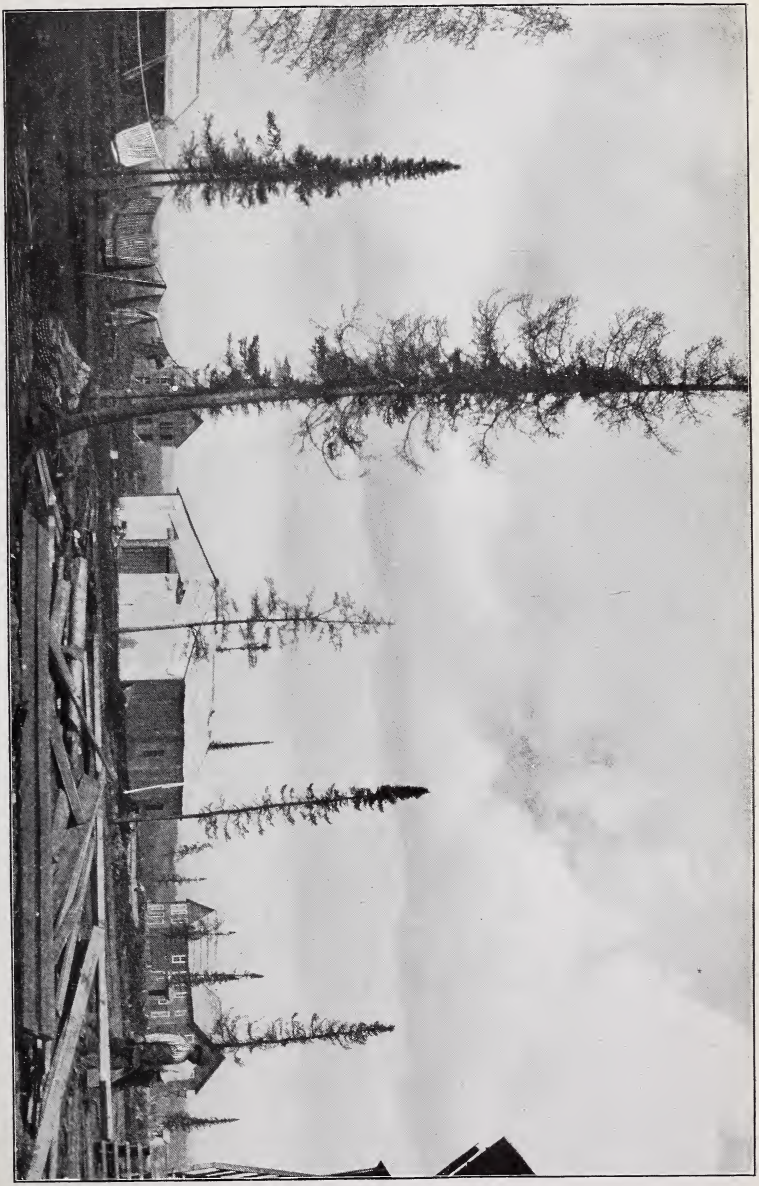
I returned to Weare August 3 and prepared at once to take the first boat down the river, while Mr. Jones and Mr. Brown returned to Rampart.

THE LOWER YUKON.

For some hundreds of miles below the mouth of the Tanana the country is rolling and generally timbered. Much of it will make good farming land, and all of it affords more or less pasture. There were half a dozen horses aboard the boat going down. Their owners fed them exclusively on grass which they cut while the boat stopped to wood-up. I saw several little meadows with rich, succulent grass 3½ feet high which would easily have made 3 tons of hay to the acre.

There are a number of Indian villages along this portion of the

PLATE XX.



FORT GIBBON IN THE PROCESS OF BUILDING.

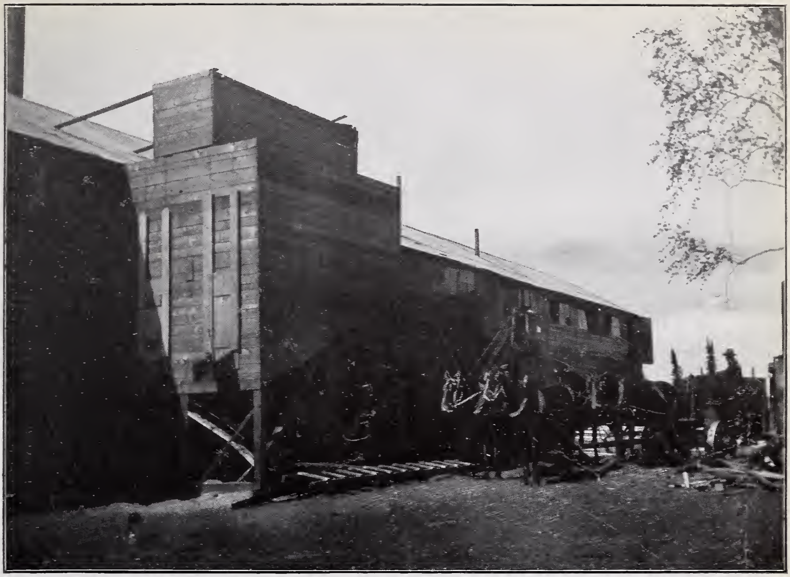


FIG. 1.—GOVERNMENT SAWMILL, FORT GIBBON.

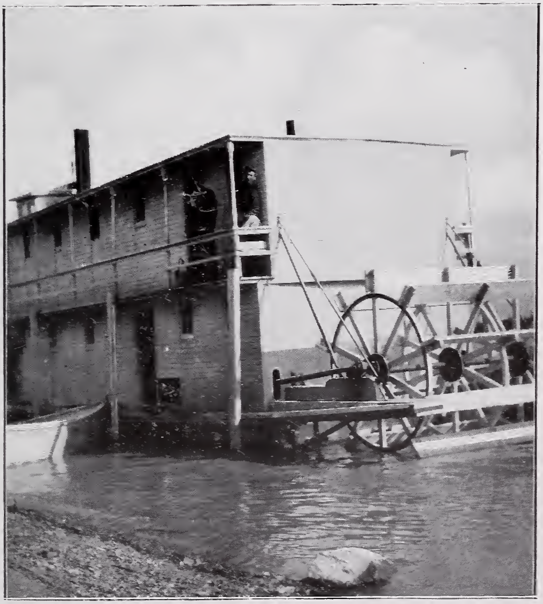


FIG. 2.—GOVERNMENT RIVER BOAT, FORT GIBBON.

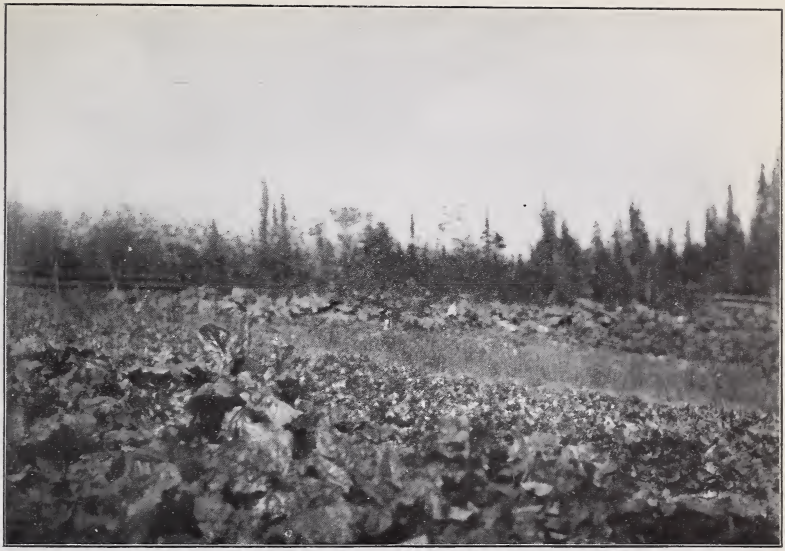


FIG. 1.—A COMPANY GARDEN, FORT GIBBON.

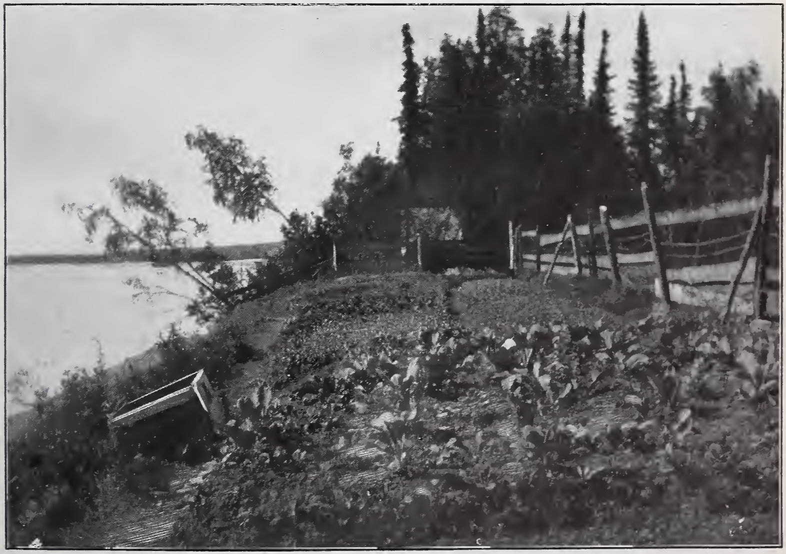


FIG. 2.—HOSPITAL GARDEN, FORT GIBBON.

LOGGING ON THE TANANA.

river. The Holy Cross Mission is perhaps the most important settlement. There is quite a large Indian village at this place and the Roman Catholic church maintains a school and orphanage for the natives. The mission is at present in charge of Father R. J. Crimont. This mission is not only famous for its good work among the natives, but also for its gardens. For several years the sisters of the mission have been noted for their success at gardening. It is really wonderful. Their cabbages, cauliflowers, potatoes, kale, carrots, etc., are equal to the best grown anywhere in the States. At the time of my visit, early in August, there were cabbages headed enough to use. They raise several hundred bushels of potatoes every year. Their gardens supply not only the needs of the mission and the natives dependent upon them, but also furnish many delicacies for passing boats. They have the largest and best gardens which have been produced in the interior up to the present. I beg leave to call attention to reports from this place on page 42.

Below Holy Cross the timber becomes smaller and gradually more scarce until finally it disappears entirely. About 150 miles from the mouth of the river the hills are entirely bare of shrubbery. Instead they are covered with moss and grass and with many species of flowering plants. Viewed from the river, the country looks like good pasture land, but on close inspection it does not prove as good as it appears from a distance. Still nearer the mouth there is an immense delta, perfectly level and only a few feet above the river. Some of it is green, but much of it is merely mud flats subject to overflow. This delta is yet too low to be valuable for farming.

It is not likely that farming can be successfully carried on along the coast of Bering Sea. Storms are severe and the salt air is injurious to most agricultural plants. Moreover, there is so much misty and cloudy weather that the sun's rays can not have the same effect that they have in the same latitude farther inland.

EXPERIMENTS WITH GRAIN AT HOLY CROSS MISSION.

No grain has been grown on the Lower Yukon up to the present time. If grain will mature there, a vast area comprising many thousand square miles can be converted into farms. A contract was, therefore, made with the superintendent of Holy Cross Mission whereby he agreed to carry out certain experiments with wheat, barley, oats, and buckwheat next year, the seed being supplied him. A set of soil thermometers for the recording of soil temperature during the growing season was also supplied. He has for years been a voluntary observer of the Weather Bureau. It is hoped that this arrangement may be the means of obtaining useful data in regard to the adaptation of that region to grain growing. The careful work in gardening for which the mission is noted is a guaranty that the grain will have a fair test.

GRAIN IN THE INTERIOR.

Mention has already been made of the fine specimens of ripe grain at Dawson, grown by a local gardener last year. To this can be added a few small panicles of ripe oats at Weare, picked on August 4. It was volunteer grain which had grown there under difficulties. Cattle had eaten off the first growth early in the season and the oats had headed out again, but it was only the few early spears which had escaped destruction that had matured seed; the later shoots were just passing out of bloom at the same date.

Since returning to Sitka I have received several heads of winter rye fully matured, forwarded to me by Mr. Isaac Jones, who found them at Rampart. They had grown from a few grains which had by some means been scattered in a vacant lot back of one of the stores. Mr. Myers, the section director of the Weather Bureau at Eagle, has forwarded me samples of perfectly ripe oats and barley grown by Mr. Peter Lundin, a Swede, who has settled at that place and is clearing up a small farm. Mr. J. E. Snevely, also of Eagle, presented me with a perpectly ripe head of wheat which he had found at Eagle about the middle of last September. These facts appear to me to furnish indisputable evidence that the grain can be matured in the interior of Alaska. With the exception of Mr. Lundin and the gardener who grew the grain at Dawson, I do not know of a person who has given grain a fair trial. The sample heads which have been gathered have grown up quite accidentally on new ground, not in proper condition. It may reasonably be inferred that on well-tilled ground and with the selection of early, hardy varieties of grain, good crops may be grown.

LUXURIANT GROWTH OF GRASSES IN THE INTERIOR.

As already remarked, at Eagle, Fort Yukon, Rampart, and other places where the moss had been destroyed, native grasses have come in and occupied the ground. This is a significant fact and a strong evidence that feed for live stock can be grown in abundance with but little effort. At Rampart and Fort Yukon the months of June and July are usually almost rainless, the moss dries out thoroughly and can be burned with ease. The trouble is, in fact, that it burns too easily and fire spreads with such rapidity that to drop a burning match endangers large areas of forest. Wherever the moss is burned, grass is the first inhabitant. There are also many natural meadows, some of them very large. Small meadows were almost invariably found when the boat stopped to wood up. On some of the tributaries of the Tanana are large natural meadows, hundreds of acres in extent. At Fort Gibbon a squad of soldiers was sent to such a meadow located some 200 miles from the fort on one of the tributaries of the Tanana. They were equipped with a mowing machine and other haymaking tools, and the mower was operated without the least difficulty. An immense natural meadow on the arctic circle, east of the Koyukuk River and south of the Tatrandike River, is reported by Mr. W. H. Harrison, of Dawson. He said it must have been 20 miles long and 4 or 5 miles broad, as it took him nearly a whole day to walk from one end to the other, and the vegetation consisted almost exclusively of grass.

St. Michael and Nome.

I arrived at St. Michael August 9 and having obtained passage on the transport *Lawton*, through the courtesy of General Randall, commanding the Department of Alaska, who was then at St. Michael, I left the same day for Nome as the *Lawton* was then unloading freight for the military post at that place. I arrived at Nome on August 12 and sailed on the 14th for Seattle.

Although St. Michael, which is located about 63° 30′ N., is considerably farther south than the points of the Yukon from which I have received samples of ripe grain, it does not seem likely that grain can be grown there. The more common sorts of hardy vegetables will probably be all that can be successfully raised anywhere in the coast region from St. Michael northward. The summers are short and cool and the storms from Bering Sea severe. There is, however, fair pasture in this region.

At Nome the conditions appear to be still more unfavorable. The vegetation consists chiefly of moss. Reindeer moss grows in abundance all over the tundra. Radishes, lettuce, turnips, and other garden crops which reach a useful state in a short time can be grown there, but beyond that the prospect is not promising.

From the Yukon Southward.

Southward from the mouth of the Yukon the conditions are decidedly more favorable. I submit herewith reports from missionaries on the Nushagak River and also data from the Kuskokwim, which prove that all the hardy garden vegetables can be grown successfully and even early maturing varieties of grain may do well there. There is an immense area of fair pasture for cattle and sheep in this region and live stock can without doubt be kept there successfully during the summer months. For winter forage it will be necessary to make hay or put up silage.

At Dutch Harbor and Unalaska are a number of fine vegetable and flower gardens. I have seen no finer pansies and daisies anywhere than I saw grow there. It is not the fault of the climate if gardening is not successful in this region, but the soil is poor, and it requires skilled work and fertilizers to obtain the best results. As far as I could learn grain had never been attempted in that region and samples of early grain were distributed, some of the settlers agreeing to grow them as an experiment.

Pasturage is abundant. The North American Commercial Company, at Dutch Harbor, had a large flock of fat and contented sheep roaming over the hills. Hogs, chickens, turkeys, and geese were likewise numerous and thrifty. The town cows at Unalaska, which ran at large, were as sleek and thrifty looking cattle as can be found anywhere.

In this connection it is of interest to note that Rev. Dr. A. W. Newhall, of Unalaska, has a silo which he has been using for the past two or three years with good success. He had it filled with native grass at the time of my visit.

The whole coast region along Bering Sea and the Alaska Peninsula is entirely treeless. The hills are a beautiful green in summer, but not a tree can be discovered anywhere.

ATTEMPTS AT TIMBER CULTURE.

Mr. James C. Blaine, United States marshal at Unalaska, and Rev. Dr. Newhall, superintendent of the Jesse Lee Home at Unalaska, have imported several hundred forest trees of many kinds from Vancouver Island. Many of them failed to grow, as might be expected from the length of time spent on the journey, in addition to being planted in uncongenial soil; but some are still alive, and with care and culture may make a fair growth.

Nearly a hundred years ago the Russians attempted to introduce trees there, but with only indifferent success. On this subject Mr. Blaine writes as follows:

> Two groves of spruce trees remain as a monument to the interest taken by the early Russians in timber culture. One is located upon Awaknak and the other upon Expedition Island. Both together will hardly cover half an acre. Though sheltered and sunny nooks have been selected for the plantations the trees have in no instance attained an altitude of 20 feet, but, with dwarfed trunks, are sending their gnarled and distorted limbs along the ground.

I am indebted to Mr. Blaine for illustrations of tree growths, one of which I submit herewith (Pl. XXIV, fig. 1).

In an account of the expedition of the brig *Rurik*, Captain Kotzebue, for the years 1815–1818, von Chamisso remarks, on page 265:

> Unalaska and the other islands of the Aleutian chain have no trees. Spruce (*Abies* [*Picea*]), brought from Sitka, have been transplanted in Unalaska, over one-half of which have died and the rest are in a very bad condition; but it must be taken into consideration that the nursery is yet too young, and how difficult it is to transplant any kind of coniferous trees.

THE AREA OF AGRICULTURAL LAND IN ALASKA.

Visitors to Alaska who make the trip from Seattle up through the inland passage as far north as Skagway and as far west as Sitka and on back to Seattle again, inside of two weeks, usually report that agri-

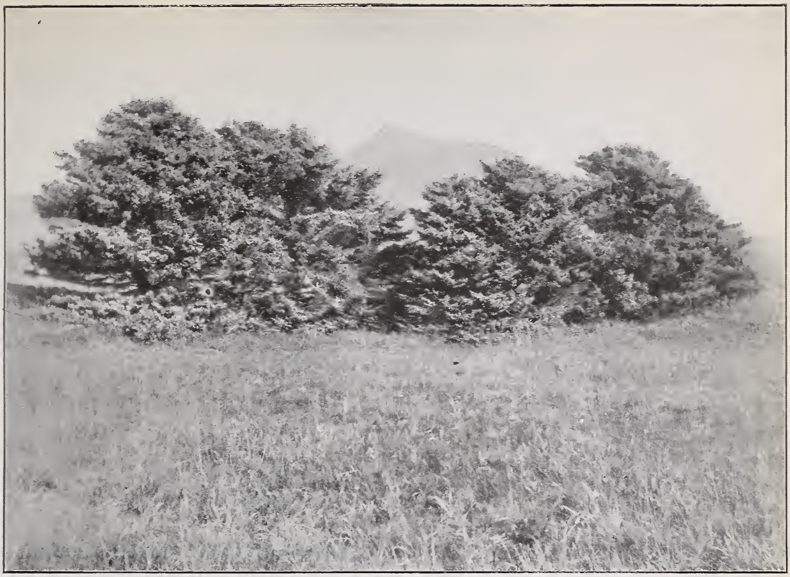


FIG. 1.—SPRUCE TREES AT DUTCH HARBOR, PLANTED BY THE RUSSIANS ABOUT 1810.

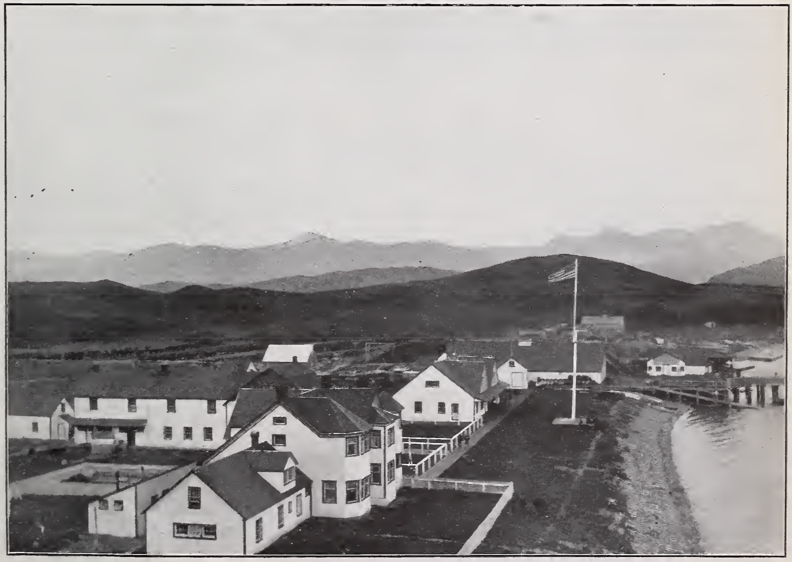


FIG. 2.—UDACTA, OR DUTCH HARBOR.

culture is impossible in Alaska even if the climate did admit of it, because there is no land which can be farmed. They make the fatal mistake of judging all of Alaska by the hillsides they have seen from the deck of their steamer. That the rocky islands and fjord-bound shores of southeastern Alaska do not contain a large amount of agricultural land is true, but there is much more than the casual observer can see from the water. Probably 5 per cent of the area of southeastern Alaska is suitable for agricultural purposes.

As I have remarked in former reports, the Kenai Peninsula and the region bordering on Cook Inlet have a very large area, thousands of square miles, which can be cultivated or pastured. But it is chiefly the vast region in the interior which will furnish the agricultural land in Alaska. There are no accurate data as to the total area which can be used for farming and pasture. No surveys have been made and only the chief river basins have been explored. But, in my judgment, at a conservative estimate, the tillable and pasture land of the Territory amount to 100,000 square miles. The total area of Alaska is 580,000 square miles (some estimates place it at 600,000 square miles) and, after careful observation of the region through which I have passed, I think it safe to assume that not more than five-sixths of the Territory consists of mountains and waste land. The term waste land, as here used, includes land which will have no value for the farmer or grazier. Future investigations are more likely to prove that the area of waste land is much smaller than this and that the percentage of agricultural land is correspondingly greater.

I do not mean that there are 100,000 square miles which can be settled and brought under cultivation with the same ease that our extensive western prairies have been broken and cultivated. There is very little, if any, land which can be compared with our prairie land.

SMALL FARMS WILL BE THE RULE.

It is not likely that there will be bonanza farms in Alaska. It is not a place for capitalists to invest in land and expensive machinery with a view to deriving large returns from the investment, but rather a place furnishing homes for the poor man. Men who possess the courage to face and sufficient energy and strength to endure the hardships incident to pioneer life in a northern climate, who can clear and till the land with their own hands, will be the future owners of Alaska farms. The criticism is sometimes advanced that farming won't pay in Alaska, even if it should prove possible to farm at all; "business men will not find it profitable." This is true only from the standpoint of the bonanza farmer. It is evident that it would not be profitable to pay hired men $5 or $10 a day to work on a farm. Not even the richest farms with the best near-by markets would justify such an outlay. Farming can be made to pay in Alaska under present conditions only when the farmer does most of the work with his own hands. He can secure good wages for his work; he can produce the beef, pork, poultry, eggs, butter, vegetables, and grain which are needed for the support of himself and family, and he can raise enough of a surplus to derive a reasonable income in cash from their sale, if he is located near some town or mining camp. This is the style of farming which will be suitable to Alaska. It is also this style of farming which will make poor men independent and which will give to the future State a class of thrifty, industrious, and self-reliant citizens; and these, after all, are the best class of citizens for any State.

The Territory is not likely to be settled with a rush such as the one which occurred when the Cherokee strip was opened to settlement. The settlement will be slow. The mining camps and towns will be the centers around which farming will first develop and from these settlements will spread over the country, but first to the most desirable lands.

AGRICULTURE IN FINLAND AS AN EXAMPLE.

The writer ventures to call attention to the agriculture in Finland in this connection because it proves what a hardy, industrious class of people can accomplish in the far north. Finland is bounded by the same parallels of latitude which bound the main portion of Alaska. The sixtieth parallel is the southern boundary of Finland and the seventieth parallel the northern. In Alaska the sixtieth parallel passes through Prince William Sound. All of southeastern Alaska and all of the peninsula is south of this latitude. The following data are obtained from the report of the Scientific Society of Helsingfors.

Finland has an area of 144,000 square miles, and of this only 34 per cent is used for farming purposes. The rest consists of forest, unreclaimed waste land, and inland lakes. That is to say, there is in round numbers about 50,000 square miles used for agricultural purposes. On this area Finland supports a population of more 2,500,000 people. According to the census of 1895 the population was 2,520,437. In 1895 Finland raised the following crops:

	Bushels.
Wheat	146,870
Barley	6,117,402
Rye	13,254,842
Oats	18,811,839
Peas	425,250
Buckwheat	82,581
Oats and barley, mixed, used for feed	449,537

In addition, there were produced in the same year 3,561,615 pounds of prepared flax and 1,446,682 pounds of prepared hemp, ready for the spinning wheel and loom. In the same year the live stock numbered as follows:

Cattle	2,398,183
Sheep	1,067,384
Horses	300,650
Hogs	197,356

For each 1,000 persons Finland had, in 1895, 559 head of cattle, 423 head of sheep, and 119 horses. During the period of five years from 1891 to 1895 Finland exported 113,743,216 pounds of butter, 1,972,185 pounds of cheese, and 6,981,000 bushels of oats. This aside from considerable live stock and meat.

If such results are possible in Finland, why should they not also be possible in Alaska? The two countries lie in the same latitude; the climate is nearly the same. Alaska has warmer summers, if also colder winters, than Finland. The area of Alaska is several times greater than that of Finland, and, in addition to all this, Alaska has the advantage of enormous mineral wealth, apparently inexhaustible fisheries along the coast, and is rich in game and fur-bearing animals. All of these resources would accrue to the benefit of the farmer, either directly or indirectly.

THE GREAT NEED OF THE DEVELOPMENT OF RESOURCES.

Col. P. H. Ray, U. S. A., late in command of the Department of Alaska, delivered an address before the Alaska Geographical Society, at Seattle, September 25, 1900, in which he gave expression to his views on the great and diversified resources of Alaska and the importance of their development. Colonel Ray's views are of interest, because he has been long in the Territory and is familiar with its obvious possibilities. The following is his address, in part, as published in the Bulletin of the Alaska Geographical Society for October, 1900:

> It is to be regretted that in all that has been said and written of Alaska, special features only have been exploited. There has not been enough told of the diversified possibilities of the country, which, if developed, would be of greater importance than all of the gold mines that have been opened up. The trouble is that too many people go there expecting too much, and consequently are disappointed. Many have an idea that there is nothing in Alaska worth going for except gold. The same was true of California in 1849; but there are greater resources in Alaska to-day, aside from the gold, than in the Pacific coast States, if the timber is left out. In almost all parts of the valley of the Yukon you can ripen oats, wheat, and all kinds of grain. I have seen blue joint grass grow 2 tons to the acre and I have seen 1,400 bushels of potatoes grown on 4 acres of ground. Timothy, I have seen standing 4 feet high and growing wild for miles around. These resources are well worth looking after and developing.
>
> Although the United States has owned Alaska for more than thirty years, only a short time ago my command cut the first road from the Yukon River. This is what is needed as much as anything else in that country, that the interior may be reached and settled up by a people who will develop the country and create a large business on the Pacific coast. Three years ago the discovery of gold in the Klondike drew nearly all the Americans to British territory, but since the discovery at Nome large numbers are coming back.
>
> The climate of Alaska is even better than on the great plains of Wyoming, Montana, and some parts of Nevada. In all parts of Alaska there are more hospitable winters. They have no severe storms in the interior, and in the dead of winter horses and cattle can be worked without any danger of being frozen. People who go

there think they will experience a great change in climate, but this is a mistake, for all last winter I very seldom wore an overcoat.

The great essential is to develop the resources of Alaska, and when this is done then people can find in their home market the necessary articles of daily consumption at a reasonable cost and will be content to live permanently in the country, which will mean the greater development of the gold properties and an increase in the output of the yellow metal.

In connection with the development of the commerce of the Pacific, Alaska is all important. It is my opinion that it should be urged upon the General Government to fortify some harbor in the Aleutian Islands to protect this interest in case of war. The resources of Alaska in fish are boundless, and greater than the North Sea and Newfoundland combined. All we want is to settle up that country with people who will stay and develop it in all of its natural resources, and there will be no grander country in any part of the United States.

To make the roads of which I have spoken, it is necessary to do little more than to cut the timber and in some places cut through the side of a bluff. It will be no greater job than it was in Wisconsin in early days. It would be an excellent idea to have Scandinavians immigrate there. They are familiar with the conditions, and in my reports to the Department I have recommended that special inducements be offered in the way of free land and an exemption from taxes for a stated period. The valley of the Yukon is richer than the valley of the Missouri and some day its true worth will be appreciated.

SEED DISTRIBUTION.

Garden seeds and some field seeds have been distributed to settlers in Alaska the past year as heretofore. The seeds comprised about a dozen kinds of the most common hardy vegetables which it was known would grow there. These distributions are an important feature of the experiments and I recommend that they be continued. Seeds are in many places unobtainable; in others costly. A few papers of seeds sent to settlers, free of charge, often stimulate the recipients to try raising a garden, which they would not have tried had none been sent. Their success encourages them to do better next year and their example is followed by others who see the results. Thus gradually vegetable growing is introduced. Nearly all who have received seeds have expressed their satisfaction with them and have applied for more the coming year. I have made it a practice to send several packages to missionaries and others who come in direct contact with many of the natives, and requested them to distribute their surplus among the natives and if practicable instruct them in their cultivation. The results are, to say the least, very encouraging. Many of the natives have thus been induced to raise gardens. I have, from time to time, also received requests for seed potatoes, for plants of various kinds, strawberries, raspberries, currant bushes, gooseberry bushes, and apple trees. As yet I have not been able to comply with any of these requests, for the reason that we have not had the plants. Fruit trees are, for obvious reasons, even more difficult to get from the States than seeds and they have been introduced in but very few places. We know, therefore, next to nothing in regard to the behavior of fruit trees in the greater portion of the Territory, and they will not be widely tested unless they are supplied by the experiment station.

I respectfully recommend that provision be made for the establishment of a nursery at the Sitka Experiment Station and that all the kinds of fruits which are likely to succeed there be tested, propagated, and distributed free of charge to those settlers who will agree to test them carefully and report the results.

ASSISTANTS.

There are at present three assistants connected with the Alaska Station. Mr. F. E. Rader, of Kansas, who was appointed April 1, to take the place at the Sitka Station vacated by Mr. C. H. Robison, resigned. Mr. Rader has done good work the past summer, having acted as special agent in charge during my absence in the interior, and he is to be commended for industry and general efficiency.

Mr. H. P. Nielsen has continued as superintendent of the Kenai Station. He likewise deserves much credit for the work he has done the past two seasons. He has with but little help done most of the work at the station, from the clearing of the land to the cultivation of the experimental crops. Mr. Isaac Jones, of California, was appointed in May last to take charge of the work which might be undertaken in the interior. He has acquitted himself well in a responsible position elsewhere and has made a good beginning at Rampart.

It is to be hoped that a horticulturist can be added to the force at the Sitka Station in the near future, and that the station may be provided with such buildings and equipments as are required for effective work in horticulture.

DEVELOPMENT WORK COSTLY.

Without desiring to plead for funds, I regard it as my duty to report the conditions of the labor market in Alaska and to call attention to the difference in cost between the establishment of experiment stations there and in the States. The agricultural experiment stations in the States were in most cases made integral parts of the agricultural colleges. The cost of establishment was merely nominal. The land was ready. It did not have to be cleared, drained, and fenced. The buildings already belonging to the colleges were utilized, and where this was not the case the States appropriated money for their construction. The sum of $15,000 annually granted to each station by the Government is practically all expended for salaries and in carrying out experiments, with occasionally a little for apparatus.

In Alaska the land must be cleared, drained, fenced, buildings erected, roads built, work stock purchased, and every implement and appliance shipped there at great expense. Labor is from 100 to 500 per cent higher in Alaska than in the States. Add to this that the vast extent of the Territory necessitates the establishment of stations in several places widely separated, and it will readily be seen that the expense of providing Alaska with experiment stations placed on an effective footing must necessarily exceed that of any of the States. Labor is the all-important element in the development of the Alaska stations; but in the interior of Alaska it costs, on a conservative estimate, five times more to accomplish a given amount of work than it would cost in any of the States. The least for which labor can be hired in the interior is $5 per day, and the average will reach $7.50 per day and board. In almost all the States labor can be hired for $1 per day, or less by the month. At the coast stations of Sitka and Kenai the least that white labor can be hired for is $2 a day. At the mines labor is paid from $2 to $2.50 per day and board.

PLANS FOR NEXT YEAR.

The experiments outlined in last year's report will be inaugurated and carried out to the extent that the funds made available for that purpose will permit. The permanent improvements and additions to necessary assets should include the following items:

At Sitka Station.

1. Finishing the headquarters building in accordance with plans.
2. Furnishing a laboratory with the necessary apparatus.
3. Building three cottages, one of which is to be occupied by an assistant and the other two for laborers employed by the year.
4. Building a small propagating house.
5. The purchase of another yoke of oxen.
6. The purchase of three cows and a bull, as a foundation for a herd.
7. The purchase of additional implements.

At Kenai Station.

8. The building of a house.
9. The purchase of another yoke of oxen.
10. The purchase of additional implements.

At Rampart Station.

11. The building of a house.
12. The building of a barn.
13. The purchase and importation of a yoke of work oxen.
14. The purchase and importation of the necessary implements.

The work of these three stations and also at Fort Yukon must first and foremost consist in the clearing and preparation of land for culture. Twenty acres should be cleared and drained at each of the three first-named stations, and 10 acres at Fort Yukon. Experiments along the lines already marked out should be continued and extended. In the interior experiments must begin with the fundamental testing of grains and vegetables, to ascertain what kinds will mature there. The Copper

River country should receive attention at an early date. If possible, the region should be visited next year, a site for a station selected, seed distributed, and arrangements made with some of the settlers to carry out some tests with a view to determine the vegetables and grains adapted to that region.

SOIL TEMPERATURES.

I submit herewith a record of soil temperatures from the following places and periods:

From Sitka Station, for the year 1899, from April 11 to October 31, and for 1900, from May 1 to November 15.

From Kenai Station, for 1899, from May 1 to October 19. I regret that the soil temperatures from Kenai for the current year have not been received at this writing.

From Eagle, Alaska, for 1900, from June 4 to August 31. This record has been kept by Mr. U. G. Myers, section director of the Weather Bureau for the interior.

And from Fort Yukon, for 1900, from June 1 to August 31. Rev. L. J. H. Wooden, missionary at Fort Yukon, has kindly consented to keep this record. No records later than August have been received from the two last-named places at this writing.

These records are obtained from two soil thermometers, one planted 6 inches deep and the other planted 24 inches deep, and with a radiation thermometer suspended 6 inches above ground without covering. The latter is a common minimum thermometer and is intended to record the lowest temperatures near the surface of the ground. The readings are taken once a day—in the morning, before the sun can have affected the soil temperature.

They represent, therefore, the daily minimum temperatures, both in the ground and at the surface. The 6-inch soil thermometer will, on bright days, register two or three degrees warmer in the evening than in the morning, while the daily fluctuation of the 24-inch thermometer is scarcely noticeable. At Sitka the highest minimum temperature indicated by the 6-inch thermometer in 1899 occurred on July 31, when it reached 61°, while the highest indicated by the 24-inch thermometer was 54.5° on August 8. In 1900 the highest minimum reached by the 6-inch thermometer was 63° on July 1, and by the 24-inch, 55.5° on several days in July and August. The warmest nights indicated by the radiation thermometer in 1899 occurred on June 19, when it reached 54°, and in 1900 on August 10 and 22, when it also reached 54°.

At Kenai the 6-inch thermometer registered 59° on July 30 and 31, and the 24-inch 52° on the first three days of August. We had no radiation thermometer at that place.

At Eagle the 6-inch thermometer registered 60° on July 1, and the 24-inch 50.5° on fourteen days in the latter part of July and the beginning of August, while the warmest night was 55° on June 27. The thermometer fell below 32° on the 4th, 5th, 7th, 8th, and 10th of June, on the 30th and 31st of July, and on the night of the 1st, 6th, 12th, 15th, 20th, 23d, 24th, and 27th of August.

At Fort Yukon the 6-inch thermometer registered 59° on the 29th and 30th of June and 15th and 17th of July, and the 24-inch thermometer reached 45° on July 25. The warmest night was on June 30, when the radiation thermometer registered 59°. It fell below 32° on the 14th and 15th of June, and then, as far as recorded, not again until August 23.

The records are too brief to warrant comparison.

WEATHER SERVICE.

As in the past, I have had supervision of the volunteer weather service on the coast, and I submit herewith condensed monthly data from the reports rendered. They indicate for each month the maximum and minimum temperatures, the daily mean temperatures, the total precipitation in inches, and the conditions of the weather as to cloudiness. The temperatures are in degree Fahrenheit. To give a better view of the weather conditions for the whole period during which we have received reports, I submit the data secured since the establishment of each station.

Soil temperatures.

SITKA EXPERIMENT STATION.

Day.	May.			June.			July.		
	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1899.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
1	42	....	....	47	44	32	51	48	46
2	42.5	....	....	48	44	32	53	48	47
3	41	....	....	46.5	44.5	35	52.5	48	41
4	41	....	....	46.5	44.5	35	53	48	48
5	41	....	....	46	44.5	35	53	48	40
6	42	....	....	47	44.5	35	54	48.5	40
7	40.5	....	....	47.5	44.5	42	54	48.5	49
8	41	....	....	47	44.5	42	54	48.5	49
9	41	....	....	48	45	46	54.5	49	49
10	41	....	....	48	45	43	55	49	49
11	42.5	....	....	48	45	43	54.5	49.5	49
12	42.5	....	....	49	45.5	46	55	50	49
13	42.5	....	....	50	45.5	46	55	50	49
14	42.5	....	....	49.5	45.5	44	55	50	44
15	43	....	....	48.5	46	37	55	50	44
16	43	....	....	49	46	36	55.5	50.5	44
17	46	....	....	49	46	36	56	51	50
18	46	....	....	48.5	46	36	56	51.5	54
19	45.5	....	....	50	46.5	36	55	51.5	43
20	46	....	....	50	46.5	44	55	51.5	52
21	47	43	....	50	46.5	39	56	51.5	50
22	48	43	....	50	46.5	38	56	51.5	52
23	46.5	43	....	50.5	47	39	57.5	51.5	51
24	45.5	43.5	....	50	47	38	57	52	53
25	45.5	43	....	50	47.5	40	57	52.5	50
26	45.5	43.5	....	52	47.5	47	57	52.5	49
27	45.5	43.5	....	52.5	47.5	46	59	52.5	49
28	46	43.5	....	52	47.5	45	60	53	51
29	47.5	43.5	....	52	47.5	45	60	53	49
30	47.5	43.5	....	51	47	44	60	53.5	50
31	46.5	43.5	....	....	....	....	61	53.5	50

Soil temperatures—Continued.

SITKA EXPERIMENT STATION—Continued.

Day.	August.			September.			October.		
	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1899.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
1	59	54	52	55	54	45	49	50.5	32
2	58	54	50	54	54	44	49	50.5	45
3	58.5	54	53	53	53.5	38	49	50	38
4	58	54	51	53	53.5	40	50	50	45
5	57.5	54	50	53	53.5	42	50	50	45
6	57.5	54	50	53	53	43	49	50	38
7	57	54	48	53	53	38	48.5	50	40
8	57	54.5	48	53	53	38	47.5	49.5	34
9	56	54	51	53	53	38	46	49	30
10	57	54	45	53	53	47	44	49	30
11	57	54	45	53	53	43	43	48.5	25
12	56.5	54	49	53	52.5	46	42.5	48	24
13	56	54	43	52	52.5	52.5	43	48	29
14	57	54	45	52	52.5	50	45	48	40
15	57	54	48	52	52.5	50	46	45.5	39
16	57	54	53	53	52.5	45	46	47	38
17	57	54	51	52	52	48	46	46	38
18	57	54	47	52	52	50	42.5	45	27
19	56	54	46	52	52	50	42	45	28
20	56	54	39	52	52	50	41	45	25
21	55.5	54	40	52	52	43	40	45	24
22	56	54	46	50	52	38	40	45	26
23	55.5	54	46	50	51.5	45	40	44.5	24
24	55	54	41	50	51.5	43	40	44.5	24
25	55	54	40	50	51	45	41.5	45	38
26	55	54	39	50	51	42	42	44	30
27	55	54	38	50	51	41	43	44	38
28	55	54	38	50	51	38	43	44	40
29	55	54	46	50	51	42	41	44	33
30	55	54	50	50	50.5	38	42	44	34
31	55	54	45	....	....	....	40	44	32

Day.	May.			June.			July.		
	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1900.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
1	48	44	34	45	47	31	63	54.5	52
2	47	43.5	31	45	46.5	30	59	54.5	50
3	48	44	43	48	47	40	60	54.5	49
4	47.5	44.5	42	48	47	41	59.5	54.5	50
5	44	44.5	27	51	47.5	41	55.5	54	40
6	46	44.5	36	50	47.5	42	57	54	42
7	44.5	44.5	33	49.5	48.5	40	57.5	54	42
8	47.5	44.5	39	50	48.5	44	59	54.5	46
9	47	45	36	50	48.5	42	61	55	52
10	47.5	45	39	50.5	48.5	42	58	55	40
11	47.5	45	30	50.5	48.5	35	58.5	55	42
12	48.5	46	33	50	49	34	60.5	55	47
13	49	46	44	53	49.5	38	59	55	50
14	49	46.5	41	55	50	42	59	55	49
15	50	46.5	42	55.5	50.5	48	58	55	50
16	50	46.5	42	55	51	43	59	55	50
17	48	47	41	54.5	50.5	42	57	55	51
18	47	47	36	54.5	51.5	44	58	55	50
19	47.5	47	36	54.5	51.5	48	56.5	54.5	51
20	49	47	41	55	51.5	47	55	54.5	41
21	47.5	47	32	54.5	51.5	46	57	54.5	46
22	50	47.5	33	52.5	51.5	44	57	54.5	52
23	48	47.5	30	54	51.5	46	57.5	54.5	52
24	48	47.5	34	55.5	51.5	40	58	54.5	44
25	47.5	47.5	34	58.5	52	45	59.5	55	49
26	50	47.5	39	58.5	53	50	58	55.5	52
27	49	47.5	39	58.5	53	44	58	55.5	52
28	49	47.5	39	58.5	53	42	58.5	55.5	44
29	48	47.5	40	58	53.5	44	57.5	55.5	49
30	48	47.5	37	60	54	42	57	55.5	46
31	45	47.5	34	....	....	....	57	55	45

Soil temperatures—Continued.

SITKA EXPERIMENT STATION—Continued.

Day.	August.			September.			October.			November.		
	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1900.	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*
1	57	55	42	55.5	54.5	47	47.5	52	26	39	44	31
2	57.5	55	51	55.5	54.5	47	47	51	33	38	43.5	20
3	58	55	52	55	54.5	39	45	50	30	38	42.5	22
4	59	55.5	51	54	54.5	41	44	50	24	38	42.5	34
5	58.5	55.5	49	54	54.5	40	44	49	24	39	42.5	33
6	57.5	55.5	45	54	54.5	40	44.5	49	34	39.5	43	40
7	58	55.5	51	54	54	39	47	49	42	40.5	43.5	35
8	58.5	55.5	48	54.5	54	49	49.5	49	42	41.5	43.5	31
9	60	55.5	49	54.5	54	49	49	49	39	42	43.5	34
10	60.5	56	54	55	54	52	49	49	38	42	43.5	36
11	59	56	44	55.5	54	45	48.5	49.5	38	41	43.5	30
12	57.5	56	42	55	54	42	46.5	49	26	38	43	24
13	58	56	50	52.5	54	32	45.5	48	33	37	42.5	28
14	56	55.5	49	52.5	54	32	46	47.5	37	36	42	25
15	54	55.5	41	52	53.5	33	46	47.5	33	36	41.5	18
16	57	55	45	51.5	53	38	46	48	35	......	......	......
17	56	55	47	53	53	43	45	48.5	38	......	......	......
18	56.5	55	47	53.5	53	48	44.5	48	42	......	......	......
19	57	55	50	......	......	......	43	48	33	......	......	......
20	57.5	55	52	......	......	......	41	47.5	29	......	......	......
21	57.5	55	44	......	......	......	41	47.5	29	......	......	......
22	58	55.5	54	......	......	......	40.5	46.5	20	......	......	......
23	57.5	55.5	53	51	53	33	40	45	26	......	......	......
24	56.5	55.5	38	51	53	36	39.5	44.5	33	......	......	......
25	56	55	32	......	......	......	39.5	44.5	33	......	......	......
26	55	55	40	......	......	......	39.5	44.5	32	......	......	......
27	55	54.5	43	......	......	......	39.5	44.5	34	......	......	......
28	55	54.5	50	51.5	53	43	39	44.5	32	......	......	......
29	56	54.5	50	50	52	31	39	44	30	......	......	......
30	56	54.5	47	49	52	36	39	44	32	......	......	......
31	56	54.5	47	......	......	......	39	44	30	......	......	......

KENAI EXPERIMENT STATION.

Day.	May.		June.		July.		August.		September.		October.	
	6-inch thermometer.	24-inch thermometer.	6-inch thermometer.	24-inch thermometer.	6-inch thermometer.	24-inch thermometer.	6-inch thermometer.	24-inch thermometer.	6-inch thermometer.	24-inch thermometer.	6-inch thermometer.	24-inch thermometer.
1899.	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*
1	......	......	38	32	54	45	58.5	52	52.5	50	39.5	45
2	......	......	38	32	53	45.5	57	52	51.5	50	39	44
3	......	......	39	32	52.5	45.5	55	52	51	50	39.5	44
4	......	......	39.5	32	52.5	47	55	51.5	52	50	40.5	43.5
5	......	......	41	32	54	46	54.5	51.5	52	50	41.5	43.5
6	......	......	42	32	54.5	46.5	54	51.5	51.5	50	39.5	43
7	......	......	41	32	57	47	55	51	51.5	50	38.5	43
8	......	......	41.5	32	58	47.5	55	51	51	50	38.5	43
9	......	......	41.5	32	58	48.5	55	51	52	50	37.5	42.5
10	36	......	43	32	58	48.5	56	51	51.5	50	37.5	42.5
11	35	......	42	32	57	49	55.5	51.5	51	50	37	42
12	36	......	45.5	32	53.5	49	54.5	51.5	51.5	49	38.5	41.5
13	36	......	45	32	52.5	49	56	51.5	49	49.5	40	41.5
14	35	......	44.5	32	50	49	54	51.5	49.5	49.5	38.5	41.5
15	36	......	45	32.5	55	49	54	51.5	49	49	39.5	41.5
16	36	......	47	32.5	55	49	55	51.5	49.5	49	39.5	41.5
17	36.5	......	48.5	33	59	50	53	51.5	49	49	38.5	41
18	36.5	......	48.5	35	59	50	52.5	51	49	48.5	36	41
19	36	......	48	37.5	56	50	53	51	45.5	48.5	35	40
20	38	......	47.5	37.5	56	50	54	51	46	48	......	......
21	39.5	......	44.5	39.5	57.5	50	53	51	42.5	47.5	......	......
22	39	......	50	40.5	57.5	50	51	50.5	42.5	47	......	......
23	39	......	50	41	58	50.5	53	50.5	41.5	47	......	......
24	39	......	52	42	55	50	52	50.5	41	46	......	......
25	39	......	51.5	42	56	50	51.5	50.5	40	45.5	......	......
26	39	......	53	42.5	56	50	51.5	50	42	45.5	......	......
27	41	......	52	43.5	57	50	52	50	43	45	......	......
28	41	32	52	44	58	50.5	52	50	......	......	......	......
29	38.5	32	51	44	58	50.5	52	50	44	45	......	......
30	38	32	52	44.5	59	51.5	52	50	41	45	......	......
31	38.5	32	......	......	59	51.5	52.5	50	......	......	......	......

Soil temperatures—Continued.

EAGLE, ALASKA. U. G. Meyers, Observer.

Day.	June.			July.			August.		
	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1900.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
1	....	....	....	60	48.5	48	53.5	50.5	29
2	....	....	....	59	49	43	54.5	50.5	34
3	....	....	....	58.5	49	44	53.5	50.5	32
4	46	38.5	27	56.5	49	43	55	50.5	46
5	48	39	31	56	49	39	54	50.5	42
6	48.5	39.5	33	55	49	37	52	50.5	31
7	48.5	40.5	29	55.5	49	40	52	50	40
8	48	40.5	37	55	48.5	42	53.5	50	38
9	45	40.5	25	54	48.5	37	54.5	50.5	39
10	47	40.5	32	54	48	42	54	50.5	41
11	45	40.5	27	51	48	38	53	50.5	42
12	46	40.5	40	51.5	47.5	32	50	50.5	28
13	51	40.5	45	53.5	47.5	36	52	50	39
14	48.5	40.5	38	53.5	47.5	35	50	49.5	45
15	46.5	41.5	34	54	48.5	35	49	49.5	28
16	49	41.5	38	57	49	46	49	49	37
17	49	41.5	33	55	49	35	49.5	48.5	34
18	46	41.5	31	55.5	49.5	37	50.5	48.5	41
19	49	41.5	42	53.5	49.5	46	48.5	48.5	44
20	49	41.5	39	52.5	49	41	49	48.5	29
21	49	42	42	52	48.5	32	48.5	48.5	39
22	49.5	42	40	52	48.5	36	46	48.5	35
23	49.5	42.5	34	52.5	48.5	42	45	48	29
24	51.5	42.5	44	56	48.5	47	46.5	47.5	26
25	51.5	43	45	54.5	49	38	47.5	47	34
26	54	43.5	53	55.5	49.5	43	43	47	39
27	58.5	44	55	57.5	50	45	42	47	30
28	58.5	45.5	46	57.5	50.5	50	43.5	46	26
29	58	47	47	56	50.5	48	44	45.5	33
30	57.5	47.5	40	53.5	50.5	31	44.5	45.5	39
31	....	....	....	53.5	50.5	29	44.5	45	42

FORT YUKON. Rev. L. J. H. Wooden, Observer.

Day.	June.			July.			August.		
	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1900.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
1	45	31	37	....	....	....	56	43	47
2	46	31	42	....	....	....	57	43	49
3	46	31	47	....	....	....	56	43	57
4	47	31	44	....	....	....	54	43	53
5	47	31	46	....	....	....	53	43	48
6	46	31	45	53	40	51	52	43	50
7	43	31	41	53	41	....	52	43	47
8	40	31	36	52	40	40	55	42	55
9	40	31	41	53	40	40	56	42	54
10	41	32	36	54	40	44	53	43	53
11	43	32	42	54	40	43	52	42	45
12	45	32	44	56	40	40	52	42	45
13	46	32	....	53	41	46	51	42	46
14	43	32	29	58	41	46	50	42	39
15	43	32	28	59	42	56	48	41	35
16	43	32	43	58	43	49	48	41	45
17	45	32	45	59	43	....	48	41	42
18	46	32	47	53	43	50	48	40	44
19	47	32	44	54	43	52	48	40	45
20	47	32	46	54	43	52	48	40	34
21	46	32	41	53	42	48	48	40	44
22	47	33	43	55	41	45	46	40	38
23	51	33	51	56	42	46	46	40	31
24	51	33	50	55	42	54	46	39	32
25	54	34	47	55	45	48	47	39	42
26	56	35	55	56	42	50	41	39	28
27	56	36	50	56	42	49	38	39	23
28	58	37	54	55	43	50	38	37	31
29	59	37	56	54	42	45	39	37	34
30	59	38	59	55	42	38	....	....	....
31	....	....	....	56	42	47	43	36	31

Meteorological observations.

SITKA. C. H. Robison, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1899.	*°F.*	*°F.*	*°F.*	*Inches.*				
May	61	29	43.	4.01	3	7	21	17
June	62	33	48.3	4.99	0	9	21	16
July	87	42	56.5	2.27	6	10	15	8
August	67	40	54.5	8.35	4	7	20	14
September	68	40	51.1	8.52	4	3	23	19
October	62	30	46.3	7.90	3	5	22	17
November	57	29	43.5	7.02	2	3	25	14
December	50	21	35.4	6.94	7	4	20	11
SITKA. Fred. E. Rader, Observer.								
1900.								
January	48	26	36.9	8.71	3	5	23	13
February	47	10	33	3.49	9	2	17	13
March	65	− 1	37.8	2.62	9	8	14	9
April	59	30	41	12.09	5	17	8	22
May	69	31	45.4	4.56	6	21	4	19
June	71	34	51.8	3.13	9	14	7	13
July	69	45	55.4	3.77	2	16	13	16
August	67	40	55.2	7.92	2	22	7	19
September	65	32	50.9	7.82	4	16	10	14
October	58	28	42.5	10.73	3	19	9	20
November	57	15	36.4	9.39	8	7	15	14
KILLISNOO. Jos. Zuboff, Observer.								
1899.								
January	40	11	29.4	6.41	6	3	22	20
February	42	3	26.5	4.80	3	0	25	20
March	44	8	28.6	2	12	6	13	7
April	47	27	38.6	1.60	5	3	22	8
May	54	26	40.6	1.40	8	3	20	6
June	65	37	48.7	3.20	1	9	20	10
July	71	44	56.5	.90	10	11	10	4
August	68	40	53.9	1.95	4	5	21	13
September	59	35	46.8	7.40	4	4	22	19
October	52	26	38.5	5.95	4	4	23	22
November	49	25	37.8	6.30	1	3	26	24
December	40	16	29.2	3.45	6	9	16	15
1900.								
January	42	11	31	5.55	3	6	22	17
February	42	10	29.9	3.35	9	4	15	12
March	50	— 2	32.4	2.40	13	3	15	12
April	53	27	40.8	6.85	4	5	21	21
May	60	40	46.2	2.20	7	8	16	10
June	....	....	....	....	....	....	....	....
July	74	46	57.8	8.45	4	12	15	12
August	70	36	54.2	2.30	1	10	20	16
September	60	35	48	4.25	5	7	18	18
October	54	28	39.5	6	2	5	24	23
JUNEAU. John McLaughlin, Observer.								
1899.								
January	44	4	27.4	4.22	11	15	5	17
February	42	4	26	3.81	15	13	....	13
March	44	10	29.2	1.58	9	9	13	10
April	52	30	40	4.28	6	3	21	19
May	69	29	45	4.68	4	23	4	15
June	68	40	52	5.63	4	8	18	20
July	86	48	62	1.06	18	8	5	7
August	71	42	56	4.88	6	11	14	16
September	66	36	50.3	9.10	5	3	22	23
October	58	26	40.4	11.90	10	6	15	18
November	56	28	40.6	6.71	7	7	16	18
December	48	11	31.4	8.32	13	12	6	16

Meteorological observations—Continued.

JUNEAU. John McLaughlin, Observer—Continued.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1900.	*°F.*	*°F.*	*°F.*	*Inches.*				
January	40	12	30.6	8.52	11	11	9	20
February	40	10	29	4.09	13	8	7	9
March	61	— 5	33.8	3.06	20	7	4	12
April	61	30	41.3	11.37	6	4	20	23
May	64	36	47.2	5	9	10	12	18
June	76	36	53.9	2.27	14	6	10	9
July	77	45	56.2	5.19	7	11	13	12
August	71	39	54.8	6.57	9	4	18	18
September	65	34	50.4	10.84	12	4	14	16
October	55	28	41.5	10.91	10	2	19	20

SKAGWAY. George Sexton, Observer.

1899.								
January	40	— 2	22.2	.94	18	4	9	8
February	44	— 9	19.2	.88	17	3	8	3
March	47	1	23.4	.13	22	3	6	2
April	61	16	41.4	.66	11	18	1	8
May	77.5	25	47.1	1.07	14	11	6	7
June	80	34	54	1.29	10	11	9	11
July	92	41	61.4	.59	19	7	5	3
August	......	......	......	......	......	......	......	......
September	76	30	50	4.68	5	9	16	17
October	53	16	35.7	3.05	10	15	6	10
November	49	24	35.7	2.62	9	6	15	10
December	45	— 1	23.5	1.44	16	4	11	9

SKAGWAY. J. T. Hayne, Observer.

1900.								
January	42	0	17.9	.86	10	13	8	7
February	41	— 3	23.6	.16	24	2	2	1
March	63	10	29.4	1.00	24	4	3	2
April	58	21	40.4	4.12	10	10	10	13
May	65	30	49	.12	23	6	2	3
June	93	37	58.6	.20	21	8	1	1
July	84	40	59.6	1.70	20	6	5	4
August	75	38	57.9	0.00	15	15	1	0

ORCA. Capt. O. J. Humphrey, Observer.

1899.								
June	77	35	51.1	......	19	1	10	9
July	86	46	61	......	15	2	14	14
August	78	41	57.1	......	11	11	7	9
September	74	31	49.2	13.90	......	......	......	......
October	59	26	38.8	17.87	12	1	18	14
November	48	28	34.4	13.02	4	5	21	16
December	47	10	28.2	9.95	12	3	16	13
1900.								
January	43	10	27.4	9.78	9	0	22	16
February	41	15	30.4	9.93	13	1	14	11
March	57	10	35.9	15.74	16	3	12	10
April	64	25	39.6	16.35	6	2	22	22
May	64	28	43.7	13.70	3	8	20	20
June	......	......	......	4.59	13	4	13	11
July	......	......	......	5.06	9	9	12	13
August	......	......	......	11.25	6	8	17	19
September	......	......	......	15.32	11	1	18	14
October (25 days)	53	25	37.8	7.68	10	3	16	17

Meteorological observations—Continued.

KENAI. H. P. Nielsen, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1899.	°*F.*	°*F.*	°*F.*	*Inches.*				
May	60	22	41	8.20	8	10	13	9
June	68	31	47.9	6.80	13	8	8	7
July	82	31	54.1	1.36	12	8	10	9
August	66	28	51.9	2.34	10	12	9	15
September	73	17	46.3	4.15	7	9	14	13
October	51	10	34.7	4.32	6	6	19	12
November	44	3	27.2	.32	6	6	18	4
December	41	−14	13	.67	14	7	10	6
1900.								
January	38	−26	7.8	1.47	15	8	8	7
February	44	−10	22.9	.31	10	4	14	4
March	52	− 8	30	.32	15	8	8	3
April	58	10	35.2	.52	8	8	14	11
May	60	21	42.7	.37	7	7	17	6
June	77	30	48.8	.55	5	0	25	4
July	72	33	54.9	.86	6	13	12	5
August	66	29	51.8	3.92	8	7	16	16
September	65	21	46.38	3.34	15	4	11	12
October	54	− 5	32.24	2.19	6	10	15	8

TYONEK. Thomas W. Hanmore, Observer.

1899.								
January	34	− 8	5.41	1	19	7	5	6
February	38	−12	15.3	.85	17	....	11	5
March	48	− 4	23.6	.65	22	....	9	2
April	52	22	37.7	1.43	19	5	6	3
May	60	30	43.1	1.05	13	10	8	5
June	68	34	53.1	1.20	24	1	5	4
July	82	45	58.7	....	18	3	10	9
August	71	38	56.4	2.72	10	8	13	17
September	70	29	49	5.51	9	11	10	14
October	52	18	35.4	4.02	9	11	11	12
November	44	7	29.2	.58	10	10	10	3
December	41	0	17	.73	20	4	7	3
1900.								
January	35	0	13.4	2.69	15	4	12	6
February	39	1	23.7	.52	14	4	10	6
March	58	1	31.9	.59	17	5	9	5
April	56	11	35.5	.60	9	10	11	6
May	68	33	45.4	.29	12	8	11	5
June	82	40	52.9	.72	23	0	7	6
July	75	40	57	1.05	18	7	6	5
August	73	31	54.6	4.94	10	5	16	17
September	67	32	48.7	4.22	14	7	9	11
October	61	10	36.3	1.87	16	3	12	8

KADIAK. William J. Fisher, Observer.

1899.								
January	51	− 1	25.3	4.72	10	2	9	16
February	52	5	33.5	4.44	7	3	18	14
March	64	11	36	4.17	18	4	9	11
April	61	23	35.9	3.02	15	2	13	14
May	62	24	44.5	4.97	15	5	11	14
June	76	34	54	2.11	20	2	8	9
July	82	41	59.4	.82	19	3	9	7
August	75	41	58.2	2.37	20	3	8	10
September	....	....	....	....	....	....	....	....
October	59	31	43.3	6.31	13	2	16	19
November	53	23	38.4	5.57	7	0	23	19
December	....	....	....	....	....	....	....	....

Meteorological observations—Continued.

KADIAK AND WOOD ISLAND. Curtis P. Coe, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1900.	°*F.*	°*F.*	°*F.*	*Inches.*				
January (27 days)	49	0	28.25	2.95	7	2	18	10
February	49	20	35.4	6.19	9	0	19	19
March	51	18	37.92	7.46	9	5	17	18
April	54	11	37.8	2.60	12	5	12	12
May	64	30	44.8	6.62	7	8	16	16
June	71	39	51.6	3.35	12	2	16	9
July	68	45	54.95	6.64	8	5	18	12
August	70	42	56.6	2.74	9	8	14	17
September	68	36	50.4	1.95	....	....	....	12
October (25 days)	63	22	41.9	1.85	4	4	18	9

COAL HARBOR, UNGA ISLAND. H. S. Tibbey, Observer.

1899.								
January	45	− 6	26.3	3.30	10	6	15	13
February	45	0	31.9	3.77	8	3	17	14
March	48	5	34.6	4.04	10	14	7	12
April	50	25	35.8	1.82	5	3	22	14
May	54	20	39.5	3.72	5	4	22	14
June	65	15	40	.39	18	1	11	4
July	79	40	54.9	6.21	12	5	14	12
August	69	42	54	4.87	5	4	22	10
September	66	32	48.7	4.99	5	3	22	11
October	58	31	43.6	5.04	7	2	22	18
November	49	21	36	1.91	10	0	20	6
December	46	5	27.9	.70	5	4	22	4
1900.								
January	46	0	28.1	2.69	5	2	24	8
February	51	17	35	4.33	3	0	25	16
March	53	10	33.4	2.09	11	3	17	8
April	47	10	32.3	15.53	1	9	20	19
May	57	24	40.7	2.16	2	14	15	8
June	69	36	49.5	1.88	1	6	23	6
July	69	40	51.6	2.91	5	7	19	17
August	69	42	54.2	5.74	0	4	27	16
September	64	34	49.4	4.65	3	7	20	13

ST. MICHAEL. Rev. J. Post, Observer.

1899.								
October	42	13	32.2	.04	3	13	15	2
November	31	1	17.4	.80	4	8	18	5
December	35	−36	4.4	0	7	7	17	0
1900.								
January	30	−38	− 6.1	.40	18	4	9	2
February	38	−13	16	1.00	13	5	10	1
March	40	−18	10.4	1.00	15	3	13	1
April	44	−26	17.6	.40	9	2	19	2
May	54	17	34.7	0	8	6	17	0
June	64	31	44.2	0	10	3	17	0

NOME. N. A. T. & T. Co., Observer.

1900.								
August (19 days)	59	28	45.4	.60	9	10	0	3
September	54	22	39	7.00	11	4	15	17

Meteorological observations—Continued.

KOTZEBUE SOUND. Anna H. Foster, Observer.

Month.	Temperature.			Total precipitation.	Weather observations (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1898.	° *F.*	° *F.*	° *F.*	*Inches.*				
June	72	27	48	(*a*)	20	(*a*)	10	(*a*)
July	81	32	55	(*a*)	14	(*a*)	17	(*a*)
August	64	38	50	(*a*)	8	(*a*)	23	(*a*)
September	50	25	39.4	(*a*)	12	(*a*)	18	(*a*)
October	43	− 5	24.3	(*a*)	18	(*a*)	13	(*a*)
November	19	−23	0	(*a*)	17	(*a*)	13	(*a*)
December	27	−39	7.2	(*a*)	13	(*a*)	18	(*a*)
1899.								
January	17	−31	−10	(*a*)	17	(*a*)	14	(*a*)
February	23	−38	− 9	(*a*)	20	(*a*)	8	(*a*)
March	32	−36	1	(*a*)	15	(*a*)	16	(*a*)
April	40	−24	12	(*a*)	16	(*a*)	14	(*a*)
May	59	− 4	29.3	(*a*)	13	(*a*)	17	(*a*)
June	53	27	37.4	(*a*)	14	(*a*)	16	(*a*)
July	67	34	49.4	(*a*)	13	(*a*)	18	(*a*)
August	67	34	50.1	(*a*)	15	(*a*)	16	(*a*)
September	63	18	38.6	(*a*)	16	(*a*)	15	(*a*)
October	37	− 2	22.0	(*a*)	8	(*a*)	23	(*a*)
November	22	−17	7	(*a*)	15	(*a*)	15	(*a*)
December	22	−35	− 9	(*a*)	13	(*a*)	18	(*a*)

a Not reported.

KOTZEBUE SOUND. Robert Samms, Observer.

1900.								
January	21	−43	−17.1	(*a*)	20	(*a*)	11	(*a*)
February	29	−25	3.3	(*a*)	19	(*a*)	9	(*a*)
March	39	−27	1.2	(*a*)	20	(*a*)	11	(*a*)
April	39	−27	7.6	(*a*)	17	(*a*)	13	(*a*)
May	44	2	28.7	(*a*)	25	(*a*)	6	(*a*)
June	65	27	39.2	(*a*)	16	(*a*)	14	(*a*)
July	71	35	53.0	(*a*)	23	(*a*)	8	(*a*)

a Not reported.

EAGLE. U. G. Myers, section director.

1899.								
August (16 days)	76	24	50.1	1.63	2	5	9	8
September	66	8	41	.30	3	7	20	7
October	41	−19	21	.65	4	9	18	7
November	33	−25	1.2	.52	2	4	24	5
December	31	−57	−19	.26	15	3	13	6
1900.								
January	23	−68	−24.8	.52	14	6	11	7
February	18	−51	− 6	.39	11	9	9	5
March	56	−46	13	.02	17	8	6	2
April	54	−12	29.3	.42	6	13	11	6
May	69	20	42.2	.84	9	17	5	7
June	87	28	52.6	1.57	8	7	15	13
July	81	31	56.9	1.88	12	9	10	13
August	79	25	49.1	2.71	2	9	20	16

FORT YUKON. L. J. H. Wooden, Observer.

1899.								
September	54	9	34.3	.10	....	....	....	....
October	40	−13	18.7	.45	4	15	12	6
November	23	−34	− 1.4	.30	8	12	10	3
December	16	−68	−16.1	.47	4	10	17	5
1900.								
January	....	−62	....	.36	19	5	7	7
February	....	−44	....	.00	20	8	0	0
March	....	−42	....	.42	14	10	7	5
April	....	−21	....	.05	15	9	6	3
May	....	....	....	....	....	....	....	....
June	93	27	58.6	1.19	6	21	3	9
July	87	41	64.2	.32	13	15	3	3

Meteorological observations—Continued.

HOLY CROSS MISSION, KOSEREFSKI, YUKON RIVER. Rev. R. J. Crimont, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1898.	°*F.*	°*F.*	°*F.*	*Inches.*				
November	32	−23	1.9	2.48	9	10	11	13
December	30	−37	3.4	....	9	15	7	5
1899.								
January	35	−40	− 3.2	5.10	15	6	10	3
February	39	−37	− 3.1	1.46	18	5	5	0
March	45	16	15.6	1.49	14	9	8	6
April	46	0	27.3	1.42	13	9	8	9
May	57	13	39.4	.30	18	12	11	8
June	74	24	50.6	....	11	12	7	....
July	82	31	56.9	....	8	6	17	....
August	70	31	51.5	3.67	0	12	19	14
September	62	17	40.9	4.40	2	15	13	19
October	44	16	30.3	1.17	4	12	15	15
November	23	− 5	10.6	.49	10	18	2	8
December	34	−40	− 2.2	.82	16	7	8	9
1900.								
January	35	−55	− 9.6	.74	23	4	4	7
February	39	−15	14.7	.57	12	8	8	8
March	44	−13	15.5	.50	22	4	5	5
April	48	−21	24.7	.46	5	15	10	6
May	63	18	42.5	.92	5	18	8	11
June	74	29	52.4	1.67	16	7	7	7
July	77	41	58.8	1.44	12	10	9	15

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